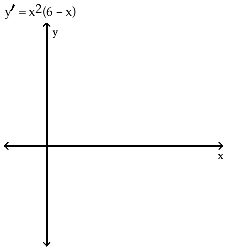
Exam

Name___________________________________

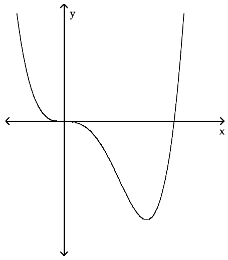
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

For the given expression $y'(x)$, sketch the general shape of the graph of $y = f(x)$. [Hint: it may be helpful to find y''.]

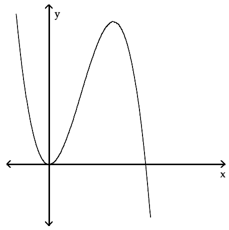
1) $y' = x^2(6 - x)$ 1)



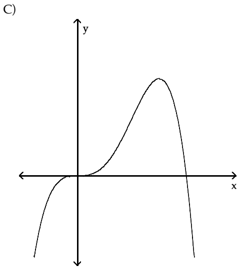
A)



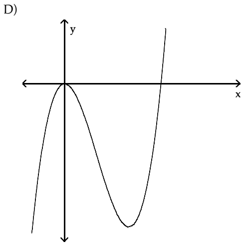
B)



C)



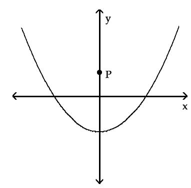
D)



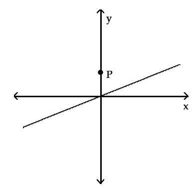
Solve the problem.

2) The graphs below show the first and second derivatives of a function $y = f(x)$. Select a possible graph of f that passes through the point P. 2)

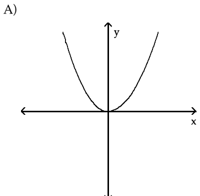
f'



f''

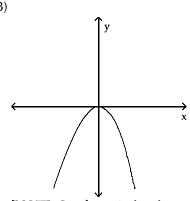


A)



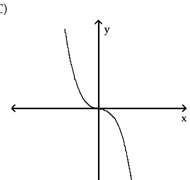
[NOTE: Graph vertical scales may vary from graph to graph.]

B)



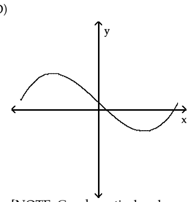
[NOTE: Graph vertical scales may vary from graph to graph.]

C)



[NOTE: Graph vertical scales may vary from graph to graph.]

D)

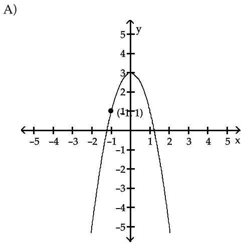


[NOTE: Graph vertical scales may vary from graph to graph.]

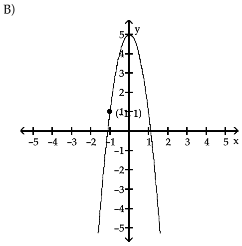
Which of the graphs shows the solution of the given initial value problem?

3) $\frac{dy}{dx} = -4x$, $y = 1$ when $x = -1$ 3)

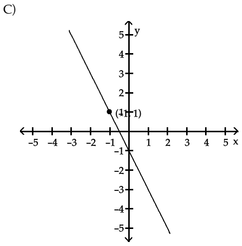
A)



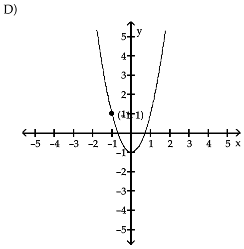
B)



C)

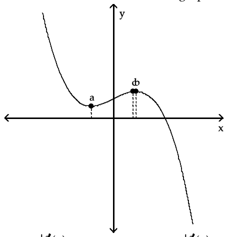


D)



Solve the problem.

4) Find the table that matches the graph below. 4)



A)

x	$f'(x)$
a	0
b	0
c	$\frac{7}{4}$

B)

x	$f'(x)$
a	does not exist
b	0
c	$\frac{1}{4}$

C)

x	$f'(x)$
a	does not exist
b	does not exist
c	$\frac{7}{4}$

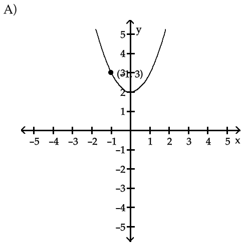
D)

x	$f'(x)$
a	0
b	0
c	$\frac{1}{4}$

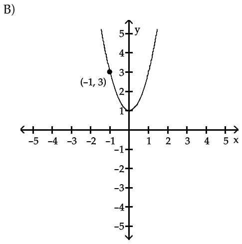
Which of the graphs shows the solution of the given initial value problem?

5) $\frac{dy}{dx} = 2x$, $y = 3$ when $x = -1$ 5)

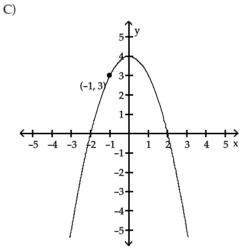
A)



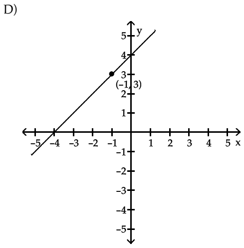
B)



C)



D)

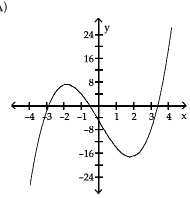


Solve the problem.

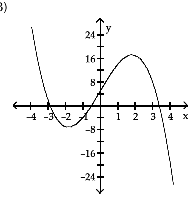
6) Using the following properties of a twice-differentiable function $y = f(x)$, select a possible graph of f. 6)

x	y	Derivatives
$x < 2$		$y' > 0, y'' < 0$
-2	11	$y' = 0, y'' < 0$
$-2 < x < 0$		$y' < 0, y'' < 0$
0	-5	$y' < 0, y'' = 0$
$0 < x < 2$		$y' < 0, y'' > 0$
2	-21	$y' = 0, y'' > 0$
$x > 2$		$y' > 0, y'' > 0$

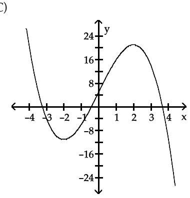
A)



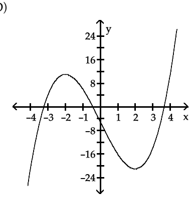
B)



C)



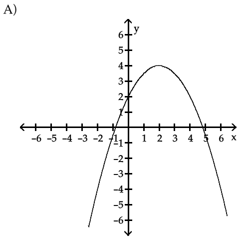
D)



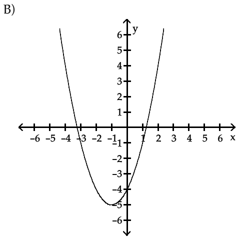
7) Find the graph that matches the given table. 7)

x	$f'(x)$
-1	0
1	does not exist
3	0

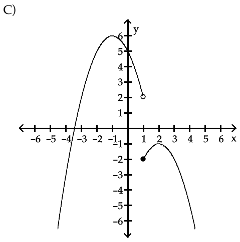
A)



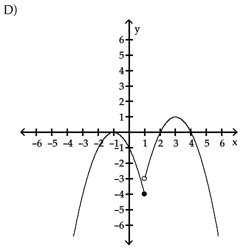
B)



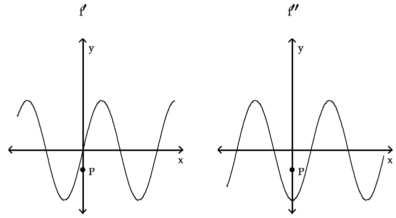
C)



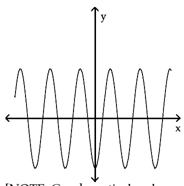
D)



8) The graphs below show the first and second derivatives of a function $y = f(x)$. Select a possible graph f that passes through the point P. 8)

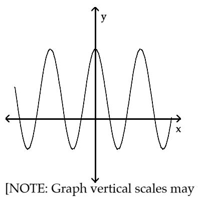


A)



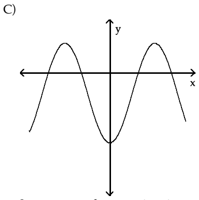
[NOTE: Graph vertical scales may vary from graph to graph.]

B)



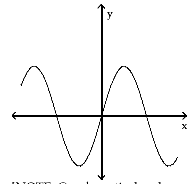
[NOTE: Graph vertical scales may vary from graph to graph.]

C)



[NOTE: Graph vertical scales may vary from graph to graph.]

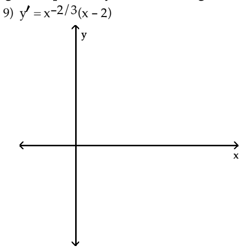
D)



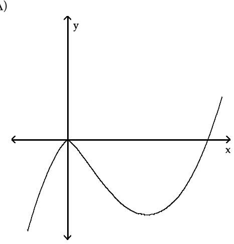
[NOTE: Graph vertical scales may vary from graph to graph.]

For the given expression $y'(x)$, sketch the general shape of the graph of $y = f(x)$. [Hint: it may be helpful to find y''.]

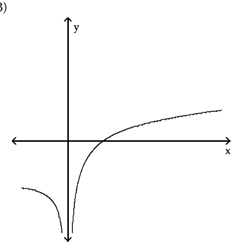
9) $y' = x^{-2/3}(x - 2)$ 9)



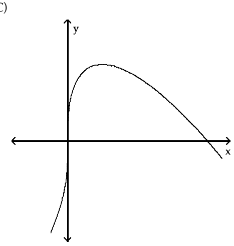
A)



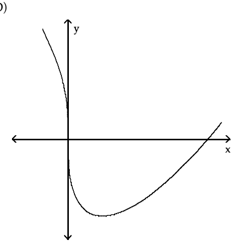
B)



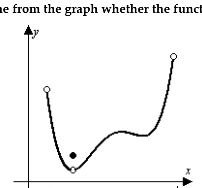
C)



D)



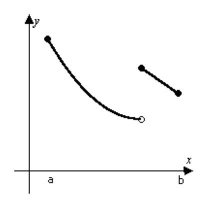
Determine from the graph whether the function has any absolute extreme values on the interval [a, b].



10) 10) ______

A) Absolute maximum only.
B) Absolute minimum and absolute maximum.
C) Absolute minimum only.
D) No absolute extrema.

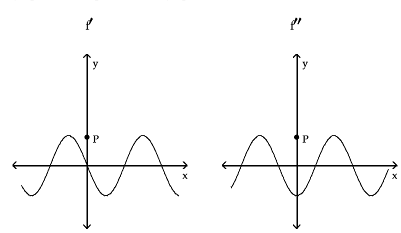
11) 11) ______



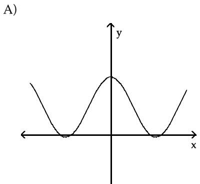
A) Absolute minimum only.
B) Absolute minimum and absolute maximum.
C) Absolute maximum only.
D) No absolute extrema.

Solve the problem.

12) The graphs below show the first and second derivatives of a function $y = f(x)$. Select a possible graph of f that passes through point P. 12)

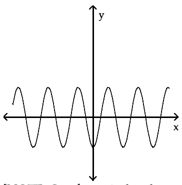


A)



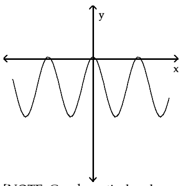
[NOTE: Graph vertical scales may vary from graph to graph.]

B)



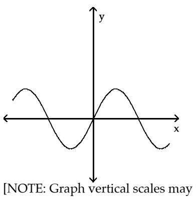
[NOTE: Graph vertical scales may vary from graph to graph.]

C)



[NOTE: Graph vertical scales may vary from graph to graph.]

D)



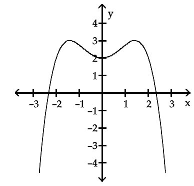
[NOTE: Graph vertical scales may vary from graph to graph.]

13) Select an appropriate graph of a twice-differentiable function y = f(x) that passes through the points $(-\sqrt{2},1)$, $\left(-\frac{\sqrt{6}}{3},\frac{5}{9}\right)$, (0,0), $\left(\frac{\sqrt{6}}{3},\frac{5}{9}\right)$ and $(\sqrt{2},1)$, and whose first two derivatives have the following sign patterns. 13)

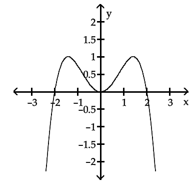
y': + $-\sqrt{2}$ − 0 + $\sqrt{2}$ −

y'': + $-\frac{\sqrt{6}}{3}$ − $\frac{\sqrt{6}}{3}$ +

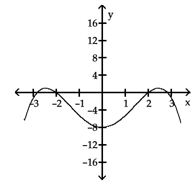
A)



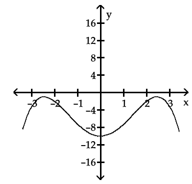
B)



C)

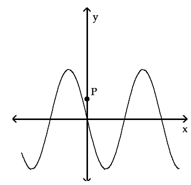


D)

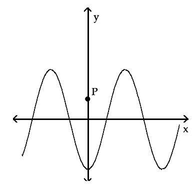


14) The graphs below show the first and second derivatives of a function y = f(x). Select a possible graph f that passes through the point P. 14)

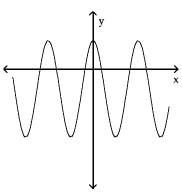
f'



f''

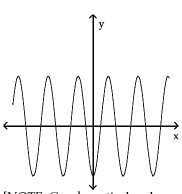


A)



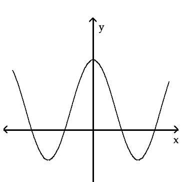
[NOTE: Graph vertical scales may vary from graph to graph.]

B)



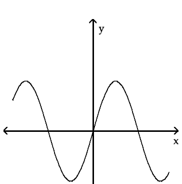
[NOTE: Graph vertical scales may vary from graph to graph.]

C)



[NOTE: Graph vertical scales may vary from graph to graph.]

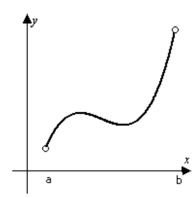
D)



[NOTE: Graph vertical scales may vary from graph to graph.]

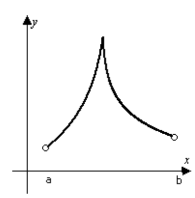
Determine from the graph whether the function has any absolute extreme values on the interval [a, b].

15) 15) ______



A) Absolute minimum and absolute maximum.
B) Absolute maximum only.
C) Absolute minimum only.
D) No absolute extrema.

16) 16) ______

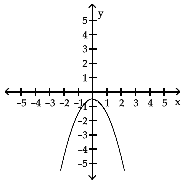


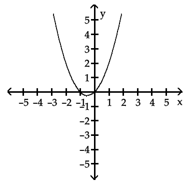
A) Absolute maximum only.
B) Absolute minimum only.
C) Absolute minimum and absolute maximum.
D) No absolute extrema.

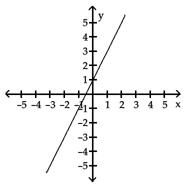
Solve the problem.

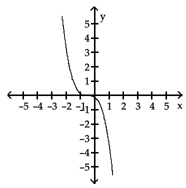
17) Find the graph that matches the given table. 17)

x	$f'(x)$
−0.5	0
3	7

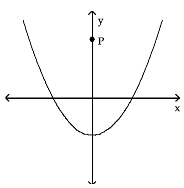
A)


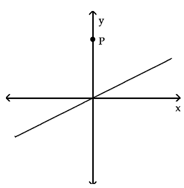
B)


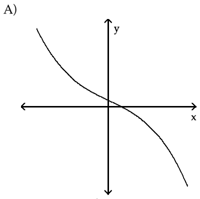
C)


D)


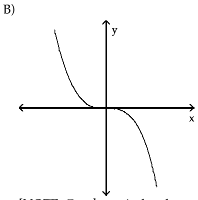
18) The graphs below show the first and second derivatives of a function $y = f(x)$. Select a possible graph f that passes through the point P. 18)

f'


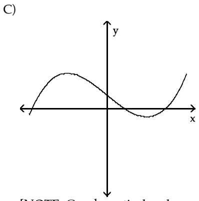
f''


A)


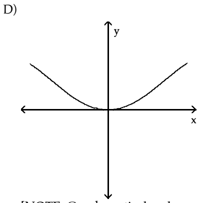
[NOTE: Graph vertical scales may vary from graph to graph.]

B)


[NOTE: Graph vertical scales may vary from graph to graph.]

C)


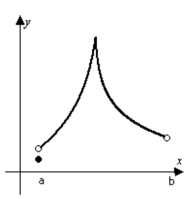
[NOTE: Graph vertical scales may vary from graph to graph.]

D)


[NOTE: Graph vertical scales may vary from graph to graph.]

Determine from the graph whether the function has any absolute extreme values on the interval [a, b].

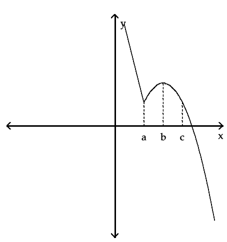
19) 19) ______



A) Absolute minimum only.
B) No absolute extrema.
C) Absolute minimum and absolute maximum.
D) Absolute maximum only.

Solve the problem.

20) Find the table that matches the given graph. 20)



A)

x	$f'(x)$
a	does not exist
b	0
c	1

B)

x	$f'(x)$
a	0
b	0
c	−1

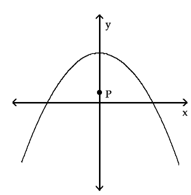
C)

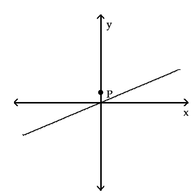
x	$f'(x)$
a	does not exist
b	does not exist
c	−1

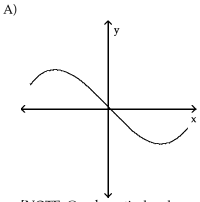
D)

x	$f'(x)$
a	does not exist
b	0
c	−1

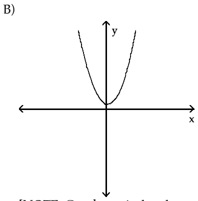
21) The graphs below show the first and second derivatives of a function $y = f(x)$. Select a possible graph f that passes through the point P. 21)

f'


f''


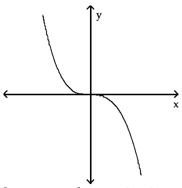
A)


[NOTE: Graph vertical scales may vary from graph to graph.]

B)


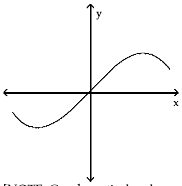
[NOTE: Graph vertical scales may vary from graph to graph.]

C)



[NOTE: Graph vertical scales may vary from graph to graph.]

D)



[NOTE: Graph vertical scales may vary from graph to graph.]

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

22) Write down the first four approximations to the solution of the equation $\sin 3x = x$ using Newton's method with an initial estimate of $x_0 = 1$. 22) ____________

Provide an appropriate response.

23) Give an example of two differentiable functions f and g with $\lim\limits_{x \to \infty} f(x) = \lim\limits_{x \to \infty} g(x) = 0$ that satisfy $\lim\limits_{x \to \infty} \dfrac{f(x)}{g(x)} = \infty$. 23) ____________

Solve the problem.

24) For $x > 0$, sketch a curve $y = f(x)$ that has $f(1) = 0$ and $f'(x) = -\dfrac{1}{x}$. Can anything be said about the concavity of such a curve? Give reasons for your answer. 24) ____________

25) Use Newton's method to find the negative fourth root of 5 by solving the equation $x^4 - 5 = 0$. Start with $x_1 = -1$ and find x_2. 25) ____________

26) Suppose $f'(-10) = 0$, $f'(x) > 0$ to the right of $x = -10$, and $f'(x) < 0$ to the left of $x = -10$. Does f have a relative minimum, a relative maximum, or neither at $x = -10$? Explain your answer. 26) ____________

27) Use Newton's method to find the four real zeros of the function $f(x) = 3x^4 - 6x^2 + 2 = 0$. 27) ____________

Estimate the limit by graphing the function for an appropriate domain. Confirm your estimate by using l'Hopital's rule. Show each step of your calculation.

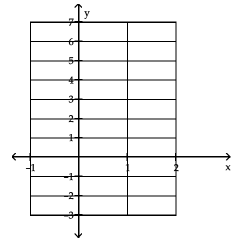
28) $\lim\limits_{x \to \infty} \sqrt{x}^{1/x}$ 28) ____________

Answer the problem.

29) Use the following function and a graphing calculator to answer the questions. 29)

$f(x) = x^4 - 5x^2 + 4x + 3$, $[-0.5, 1.8]$

a). Plot the function over the interval to see its general behavior there. Sketch the graph below.



b). Find the interior points where $f' = 0$ (you may need to use the numerical equation solver to approximate a solution). You may wish to plot f' as well. List the points as ordered pairs (x, y).

c). Find the interior points where f' does not exist. List the points as ordered pairs (x, y).

d). Evaluate the function at the endpoints and list these points as ordered pairs (x, y).

e). Find the function's absolute extreme values on the interval and identify where they occur.

Solve the problem.

30) If the derivative of an odd function g(x) is zero at $x = c$, can anything be said about the value of g' at $x = -c$? Give reasons for you answer. 30) ____________

31) Sketch a continuous curve $y = f(x)$ with the following properties: $f(2) = 3$; $f''(x) > 0$ for $x > 4$; and $f''(x) < 0$ for $x < 4$. 31) ____________

Provide an appropriate response.

32) Suppose Newton's Method is used with an initial guess x_0 that lies at a critical point (a, b), $b \neq 0$. What happens to x_1 and later approximations? Give reasons for your answer. 32) ____________

Answer the question.

33) Decide if the statement is true or false. If false, explain. 33) ____________

The points $(-1, -1)$ and $(1, 1)$ lie on the graph of $f(x) = \dfrac{1}{x}$. Therefore, the Mean Value Theorem insures us that there exists some value $x = c$ on $(-1, 1)$ for which $f'(x) = \dfrac{1 - (-1)}{1 - (-1)} = 1$.

Provide an appropriate response.

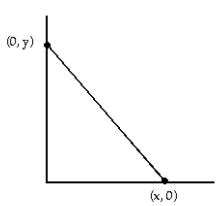
34) Which one is correct, and which one is wrong? Give reasons for your answers. 34) ____________

(a) $\lim\limits_{x \to -2} \dfrac{x + 2}{x^2 - 4} = \lim\limits_{x \to -2} \dfrac{1}{2x} = -\dfrac{1}{4}$

(b) $\lim\limits_{x \to -2} \dfrac{x + 2}{x^2 - 4} = \dfrac{0}{-8} = 0$

Solve the problem.

35) You are planning to close off a corner of the first quadrant with a line segment 15 units long running from (x,0) to (0,y). Show that the area of the triangle enclosed by the segment is largest when $x = y$. 35) ____________



36) Let $f(x) = 4\sqrt{|x|} - x^2$. 36) ____________

(a) Find $f'(x)$ as a piecewise defined function. Does $f'(0)$ exist?
(b) Find all local minimum values and where they occur.
(c) Find all local maximum values and where they occur.
(d) Find the absolute maximum value and the absolute minimum value, or explain why they do not exist.

37) Use Newton's method to estimate the solutions of the equation $2x^4 + 3x - 6 = 0$. Start with $x_1 = 1$ for the right-hand solution and with $x_0 = -1.5$ for the solution on the left. Then, in each case find x_2. 37) ____________

Provide an appropriate response.

38) Let $f(x) = \begin{cases} 2x + 4 & x \neq 0 \\ 0 & x = 0 \end{cases}$ and $g(x) = \begin{cases} x + 1 & x \neq 0 \\ 0 & x = 0 \end{cases}$. Show that $\lim\limits_{x \to 0} \dfrac{f'(x)}{g'(x)} = 2$ but $\lim\limits_{x \to 0} \dfrac{f(x)}{g(x)} = 4$. Explain why this does not contradict l'Hopital's Rule. 38) ____________

Solve the problem.

39) The function: 39) ____________

$P(x) = 2x + \dfrac{300}{x} \quad 0 < x < \infty$

models the perimeter of a rectangle of dimensions x by $\dfrac{150}{x}$.

(a) Find the extreme values for P.
(b) Give an interpretation in terms of perimeter of the rectangle for any values found in part (a).

Answer the question.

40) Assume that f(x) and g(x) are two functions with the following properties: g(x) and f(x) are everywhere continuous, differentiable, and positive; f(x) is everywhere increasing and g(x) is everywhere decreasing. Which of the following functions are everywhere decreasing? Prove your assertions. 40) ____________

i). $h(x) = f(x) + g(x)$
ii). $j(x) = f(x) \cdot g(x)$
iii). $k(x) = \dfrac{g(x)}{f(x)}$
iv). $p(x) = [f(x)]^{g(x)}$
v). $r(x) = f(g(x)) = (f \circ g)(x)$

Solve the problem.

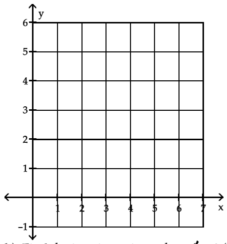
41) Use Newton's method to estimate the one real solution of the equation $5x^5 - 2x - 4 = 0$. Start with $x_1 = 1$. Then, in each case find x_2. 41) ____________

Answer the problem.

42) Use the following function and a graphing calculator to answer the questions. 42)

$f(x) = \sqrt{5x} + 0.9 \sin x$, $[0, 2\pi]$

a). Plot the function over the interval to see its general behavior there. Sketch the graph below.



b). Find the interior points where $f' = 0$ (you may need to use the numerical equation solver to approximate a solution). You may wish to plot f' as well. List the points as ordered pairs (x, y).

c). Find the interior points where f' does not exist. List the points as ordered pairs (x, y).

d). Evaluate the function at the endpoints and list these points as ordered pairs (x, y).

e). Find the function's absolute extreme values on the interval and identify where they occur.

Solve the problem.

43) Let $c(x) = t(p_0 - p)p^3$ where t and p_0 are constants. Show that c(x) is greatest when $p = \frac{3}{4}p_0$. 43) ____________

44) A team of engineers is testing an experimental high–voltage fuel cell with a potential application as an emergency back–up power supply in cell phone transmission towers. Unfortunately, the voltage of the prototype cell drops with time according to the equation $V(t) = -0.0306t^3 + 0.373t^2 - 2.16t + 15.1$, where V is in volts and t is the time of operation in hours. The cell provides useful power as long as the voltage remains above <v> volts. Use Newton's method to find the useful working time of the cell to the nearest tenth of an hour (that is, solve V(t) = 3.4 volts). Use t = 7 hours as your initial guess and show all your work. 44) ____________

45) The curve $y = \tan x$ crosses the line $y = 4x$ between $x = 0$ and $x = \frac{\pi}{2}$. Use Newton's method to find where the line and the curve cross. (Round your answer to two decimal places.) 45) ____________

Give an appropriate answer.

46) Show that the function $f(x) = x^3 + \frac{3}{x^2} + 2$ has exactly one zero on the interval $(-\infty, 0)$. 46) ____________

Estimate the limit by graphing the function for an appropriate domain. Confirm your estimate by using l'Hopital's rule. Show each step of your calculation.

47) $\lim\limits_{x \to 0} \frac{\cos x - 1}{e^x - x - 1}$ 47) ____________

Solve the problem.

48) Use Newton's method to estimate the solutions of the equation $3x^2 + 4x - 5 = 0$. Start with $x_1 = 0.5$ for the right–hand solution and with $x_0 = -2$ for the solution on the left. Then, in each case find x_2. 48) ____________

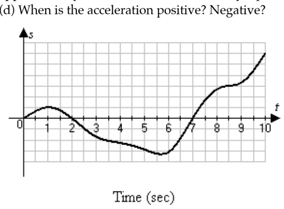
49) Sketch a smooth curve through the origin with the following properties: $f'(x) > 0$ for $x < 0$; $f'(x) < 0$ for $x > 0$; $f''(x)$ approaches 0 as x approaches $-\infty$; and $f''(x)$ approaches 0 as x approaches ∞. 49) ____________

Answer the question.

50) As x moves from left to right though the point c = 6, is the graph of $f(x) = x + \frac{1}{x}$ rising, or is it falling? Give reasons for your answer. 50) ____________

Solve the problem.

51) The graph below shows the position s = f(t) of a body moving back and forth on a coordinate line. (a) When is the body moving away from the origin? Toward the origin? At approximately what times is the (b) velocity equal to zero? (c) Acceleration equal to zero? (d) When is the acceleration positive? Negative? 51) ____________



52) Use Newton's method to estimate the solution of the equation $2\sin x - 4x + 5 = 0$. Start with $x_1 = 1.5$. Then, in each case find x_2. 52) ____________

Provide an appropriate response.

53) Find the error in the following incorrect application of L'Hopital's Rule. 53) ____________

$$\lim_{x \to -2} \frac{x^3 - 2x^2 + 1}{3x^2 - 6x} = \lim_{x \to -2} \frac{3x^2 - 4x}{6x - 6} = \lim_{x \to -2} \frac{6x - 4}{6} = \frac{-16}{6}.$$

Solve the problem.

54) Use Newton's method to find the two real solutions of the equation $x^4 - 3x^3 - 3x^2 - 3x + 4 = 0$. 54) ____________

Provide an appropriate response.

55) Explain why the following four statements ask for the same information. 55) ____________

(i) Find the roots of $f(x) = 3x^3 - 3x - 1$

(ii) Find the x–coordinates of the intersections of the curve $y = x^3$ with the line $y = 3x + 1$.

(iii) Find the x–coordinates of the points where the curve $y = x^3 - 3x$ crosses the horizontal line $y = 1$.

(iv) Find the values of x where the derivative of $g(x) = \frac{3}{4}x^4 - \frac{3}{2}x^2 - x + 5$ equals zero.

Answer the question.

56) A marathoner ran the 26.2 mile New York City Marathon in 2.1 hrs. Did the runner ever exceed a speed of 9 miles per hour? 56) ____________

Provide an appropriate response.

57) Apply Newton's method to $f(x) = \sqrt[a]{x}$, $a > 0$, and write an expression for x_{n+1}. If the initial guess x_o is greater than or equal to 1, what happens to $|x_{n+1}|$ as $n \to \infty$? 57) ____________

Estimate the limit by graphing the function for an appropriate domain. Confirm your estimate by using l'Hopital's rule. Show each step of your calculation.

58) $\lim\limits_{x \to 0} \frac{1}{\sin x} - \frac{1}{\sqrt{x}}$ 58) ____________

Solve the problem.

59) Find the inflection points (if any) on the graph of the function and the coordinates of the points on the graph where the function has a local maximum or local minimum value. Then graph the function in a region large enough to show all these points simultaneously. Add to your picture the graphs of the function's first and second derivatives. 59) ____________

$y = x^3 - 15x^2$

Estimate the limit by graphing the function for an appropriate domain. Confirm your estimate by using l'Hopital's rule. Show each step of your calculation.

60) $\lim\limits_{x \to 0^+} x^{\sqrt{x}}$ 60) ____________

Solve the problem.

61) Let $f(x) = |x^3 - 16x|$ 61) ____________

(a) Does $f'(0)$ exist?
(b) Does $f'(4)$ exist?
(c) Does $f'(-4)$ exist?
(d) Determine all extrema of f.

62) Use Newton's method to estimate the solutions of the equation $4x - 2x^2 + 3 = 0$. Start with $x_1 = 1.5$ for the right–hand solution and with $x_0 = -1$ for the solution on the left. Then, in each case find x_2. 62) ____________

63) Find the approximate values of r_1 through r_4 in the factorization $6x^4 - 12x^3 - 7x^2 + 13x - 1 = 6(x - r_1)(x - r_2)(x - r_3)(x - r_4)$. 63) ____________

64) If the derivative of an even function f(x) is zero at x = c, can anything be said about the value of f' at $x = -c$? Give reasons for your answer. 64) ____________

Estimate the limit by graphing the function for an appropriate domain. Confirm your estimate by using l'Hopital's rule. Show each step of your calculation.

65) $\lim\limits_{x \to 2} \frac{x\sqrt{x} - 2\sqrt{x} + 2x - 4}{x - 2}$ 65) ____________

Give an appropriate answer.

66) Show that the function $r(\theta) = 4 \cot \theta + \frac{1}{\theta^2} + 1$ has exactly one zero on the interval $(0, \pi)$. 66) ____________

Answer the question.

67) It took 26 seconds for the temperature to rise from 5° F to 140° F when a thermometer was taken from a freezer and placed in boiling water. Although we do not have detailed knowledge about the rate of temperature increase, we can know for certain that, at some time, the temperature was increasing at a rate of $\frac{135}{26}$° F/sec. Explain.

Provide an appropriate response.

68) Show that if h > 0, applying Newton's method to

$$f(x) = \begin{cases} \sqrt{x-8}, & x \ge 8 \\ -\sqrt{8-x}, & x < 8 \end{cases}$$

leads to $x_2 = h$ if $x_0 = h$ and to $x_2 = -h$ if $x_0 = -h$ when $0 < 8 < h$.

Solve the problem.

69) A manufacturer uses raw materials to produce p products each day. Suppose that each delivery of a particular material is \$d, whereas the storage of that material is x dollars per unit stored per day. (One unit is the amount required to produce one product). How much should be delivered every x days to minimize the average daily cost in the production cycle between deliveries?

70) The function $y = \cot x - \frac{2\sqrt{3}}{3}\csc x$ has an absolute maximum value on the interval $0 < x < \pi$. Find it.

Provide an appropriate response.

71) You plan to estimate π to five decimal places by using Newton's method to solve the equation cos x = 0. Does it matter what your starting value is? Give reasons for your answer.

72) If $f(x) = (x-3)^2$ and $g(x) = -\frac{1}{(x-3)^2}$, show that $\lim_{x\to 3} f(x)^{g(x)} = \infty$.

Estimate the limit by graphing the function for an appropriate domain. Confirm your estimate by using l'Hopital's rule. Show each step of your calculation.

73) $\lim_{x\to\infty} \frac{x}{2^x}$

Solve the problem.

74) Consider the quartic function

$f(x) = ax^4 + bx^3 + cx^2 + dx + e,\ a \ne 0.$

Must this function have at least one critical point? Give reasons for your answer. (Hint: Must $f'(x) = 0$ for some x?) How many local extreme values can f have?

75) Imagine there is a function for which $f'(x) = 0$ for all x. Does such a function exist? Is it reasonable to say that *all* values of x are critical points for such a function? Is it reasonable to say that *all* values of x are extreme values for such a function. Give reasons for your answer.

Answer the question.

76) The function:

$$f(x) = \begin{cases} -3x & 0 \le x < 1 \\ 0 & x = 1 \end{cases}$$

is zero at x = 0 and x = 1 and differentiable on (0, 1), but its derivative on (0,1) is never zero. Does this example contradict Rolle's Theorem?

Solve the problem.

77) Use Newton's method to estimate the one real solution of $-3x^3 - 2x - 1 = 0$. Start with $x_1 = -0.5$and then find x_2.

Provide an appropriate response.

78) Which one is correct, and which one is wrong? Give reasons for your answers.

(a) $\lim_{x\to 4} \frac{x-4}{x^2-4} = \lim_{x\to 4} \frac{1}{2x} = \frac{1}{8}$

(b) $\lim_{x\to 4} \frac{x-4}{x^2-4} = \frac{0}{12} = 0$

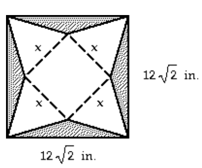
79) A student attempted to use l'Hôpital's Rule as follows. Identify the student's error.

$$\lim_{x\to\infty} \frac{\sin(1/x)}{e^{1/x}} = \lim_{x\to\infty} \frac{-x^{-2}\cos(1/x)}{-x^{-2}e^{1/x}} = \lim_{x\to\infty} \frac{\cos(1/x)}{e^{1/x}} = \frac{1}{1} = 1$$

Solve the problem.

80) Can anything be said about the graph of a function y = f(x) that has a second derivative that is always equal to zero? Give reasons for your answer.

81) A square sheet of stiff paper measures $12\sqrt{2}$ in. by $12\sqrt{2}$ in., so the diagonals measure 24 in. A pyramid is to be created by removing the four congruent shaded triangles shown below, and then folding along the dotted lines. The base of the pyramid is to be a square measuring x in. by x in.



(a) Find the height of the pyramid as a function of x.
(b) Find the volume of the pyramid as a function of x.
(c) Find the maximum possible volume of the pyramid and the value of x for which it occurs.

82) Use Newton's method to estimate the one real solution of $3x^3 - 2x - 1 = 0$. Start with $x_1 = 1$ and then find x_2.

83) Let $f(x) = \frac{1}{2}x^3 - x^2 - 2x + 2$.

(a) Find the intervals on which the function is increasing.
(b) Find the intervals on which the function is decreasing.
(c) Sketch a graph of y = f(x) along with the line through (−2, f(−2)) and (0, f(0)).
(d) Find any values of c in the interval (−2, 0) that satisfy $f'(c) = \frac{f(0) - f(-2)}{0 - (-2)}$

Estimate the limit by graphing the function for an appropriate domain. Confirm your estimate by using l'Hopital's rule. Show each step of your calculation.

84) $\lim_{x\to 0} \frac{1-\cos x}{x}$

Answer the question.

85) Suppose that g(0) = −5 and that $g'(t) = -4$ for all t. Must g(t) = −4t − 5 for all t?

Solve the problem.

86) The position of a particle moving along the x-axis is given by $x(t) = \cos(\pi t^2)$ for $0 \le t \le 3$.

(a) Give the particle's velocity as a function of t.
(b) Give the particle's acceleration as a function of t.
(c) For what values of t is the particle moving to the right?
(d) Find the acceleration at the first instant when the particle returns to its starting position.

87) Use Newton's method to find the positive fourth root of 2 by solving the equation $x^4 - 2 = 0$. Start with $x_1 = 1$ and find x_2.

88) Find the inflection points (if any) on the graph of the function and the coordinates of the points on the graph where the function has a local maximum or local minimum value. Then graph the function in a region large enough to show all these points simultaneously. Add to your picture the graphs of the function's first and second derivatives.

$y = x^5 - 4x^4 - 200$

89) How many solutions does the equation $\cos 4x = 0.95 - x^2$ have?

90) Show that $g(x) = \frac{a+x}{\sqrt{b^2 + (a+x)^2}}$ is an increasing function of x.

Provide an appropriate response.

91) Find the error in the following incorrect application of L'Hopital's Rule.

$$\lim_{x\to 0} \frac{\sin x}{x + x^2} = \lim_{x\to 0} \frac{\cos x}{1 + 2x} = \lim_{x\to 0} \frac{-\sin x}{2} = 0.$$

Solve the problem.

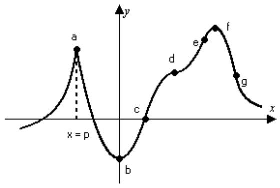
92) Use Newton's method to estimate the solutions of the equation $-3x^2 - 2x + 5 = 0$. Start with $x_1 = 0.5$ for the right-hand solution and with $x_0 = -2$ for the solution on the left. Then, in each case find x_2.

93) Give reasons for your answers.
Let $f(x) = (x-8)^{2/3}$

(a) Does $f'(8)$ exist?
(b) Show that the only local extreme value of f occurs at x = 8.
(c) Does the result of (b) contradict the Extreme Value Theorem?
(d) Repeat parts (a) and (b) for $f(x) = (x-c)^{2/3}$.

94) Marcus Tool and Die Company produces a specialized milling tool designed specifically for machining ceramic components. Each milling tool sells for \$4, so the company's revenue in dollars for x units sold is R(x) = 4x. The company's cost in dollars to produce x tools can be modeled as $C(x) = 299 + 30x^{5/8}$. Use Newton's method to find the break-even point for the company (that is, find x such that C(x) = R(x)). Use x = 370 as your initial guess and show all your work.

95) The accompanying figure shows a portion of the graph of a function that is twice-differentiable at all x except at x = p. At each of the labeled points, classify y' and y'' as positive, negative, or zero. 95) ____________

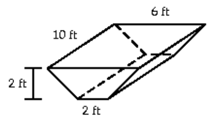


Provide an appropriate response.

96) If $f(x) = (x - 3)^2$ and $g(x) = \dfrac{1}{(x - 3)^2}$, show that $\lim\limits_{x \to 3} f(x)^{g(x)} = 0$ 96) ____________

Solve the problem.

97) 97) ____________



A trough is 10 ft long as shown in the figure. Each end is a trapezoid of height 2 ft with bottom base 2 ft and top base 6 ft. Water is flowing into the trough at the rate of $5 ft^3$ per minute. Let A represent the area of the top surface of the water, let h represent the depth of the water in the trough, and let V represent the volume of the water in the trough.

(a) Find expressions for A and V in terms of h.

(b) Find $\dfrac{dh}{dt}$ when the depth of the water, h, is $\dfrac{1}{2}$ ft. Include appropriate units.

(c) Find $\dfrac{dA}{dt}$ when $h = \dfrac{1}{2}$ ft. Include appropriate units.

Answer the question.

98) A trucker handed in a ticket at a toll booth showing that in 3 hours he had covered 233 miles on a toll road with speed limit 65 mph. The trucker was cited for speeding. Why? 98) ____________

Solve the problem.

99) What can you say about the inflection points of the quartic curve $y = ax^4 + b x^3 + cx^2 + dx + e$, $a \neq 0$? Give reasons for your answer. 99) ____________

100) If f(x) is a differentiable function and $f'(c) = 0$ at an interior point c of f's domain, and if $f''(x) > 0$ for all x in the domain, must f have a local minimum at x = c? Explain. 100) ____________

Provide an appropriate response.

101) Give an example of two differentiable functions f and g with $\lim\limits_{x \to \infty} f(x) = \lim\limits_{x \to \infty} g(x) = \infty$ that satisfy $\lim\limits_{x \to \infty} \dfrac{f(x)}{g(x)} = 4$. 101) ____________

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

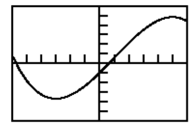
Determine the location of each local extremum of the function.

102) $f(x) = x^3 - 12x^2 + 48x - 2$ 102) _____

A) Local maximum at 4; local minimum at −4
B) Local minimum at 4
C) Local maximum at 4
D) No local extrema

Solve the problem.

103) Find the interval or intervals on which the function whose graph is shown is increasing. 103) _____



[−6, 6] by [−6, 6]

A) [−2, 3]
B) [−3, 5]
C) $(-\infty, -3] \cup [5, \infty)$
D) $(-\infty, -2] \cup [3, \infty)$

Answer each question appropriately.

104) Find a curve y = f(x) with the following properties: 104) _____

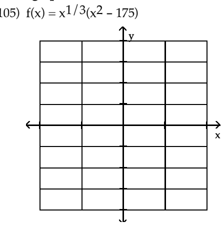
i. $\dfrac{d^2y}{dx^2} = 4x$

ii. The graph passes through the point (0,1) and has a horizontal tangent at that point.

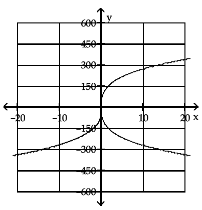
A) $y = 4x + 1$
B) $y = \frac{2}{3}x^3 + x + 1$
C) $y = \frac{2}{3}x^3 + 1$
D) $y = 2x^2 + 1$

Sketch the graph and show all local extrema and inflection points.

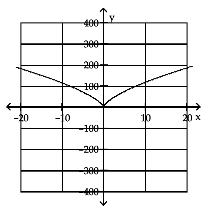
105) $f(x) = x^{1/3}(x^2 - 175)$ 105)



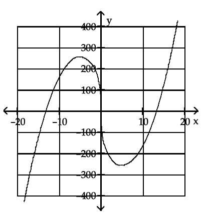
A) No extrema
Inflection point: (0,0)



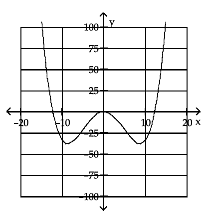
B) Min: (0,0)
No inflection points



C) Local max: $\left(-5, 150\sqrt[3]{5}\right)$, min: $\left(5, -150\sqrt[3]{5}\right)$
Inflection point: (0,0)



D) Local max: (0,0), min: $\left(\pm\sqrt{75}, -\dfrac{75}{2}\right)$
Inflection points: $\left(\pm 5, -\dfrac{25}{3}\right)$



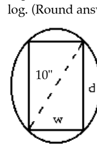
Use l'Hopital's Rule to evaluate the limit.

106) $\lim\limits_{x \to \infty} \dfrac{x^2 - 9x + 9}{x^3 + 6x^2 + 11}$ 106) _____

A) −1
B) ∞
C) 0
D) 1

Solve the problem.

107) The strength S of a rectangular wooden beam is proportional to its width times the square of its depth. Find the dimensions of the strongest beam that can be cut from a 10-in.-diameter cylindrical log. (Round answers to the nearest tenth.) 107) _____



A) w = 4.8; d = 9.2
B) w = 5.8; d = 8.2
C) w = 6.8; d = 9.2
D) w = 6.8; d = 7.2

108) How close does the semicircle $y = \sqrt{16 - x^2}$ come to the point $(1, \sqrt{2})$? 108) _____

A) x = 1.73
B) x = 3.00
C) x = 0.27
D) x = 2.27

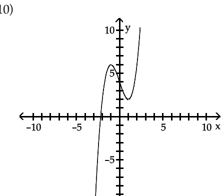
Find an antiderivative of the given function.

109) $\dfrac{8}{5}x^{9/5}$ 109) _____

A) $\frac{8}{5}x^{14/5}$
B) $\frac{4}{7}x^{14/9}$
C) $\frac{4}{7}x^{14/5}$
D) $\frac{8}{9}x^{14/9}$

Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down.

110) 110)



A) Local minimum at x = +1; local maximum at x = −1; concave down on $(0, \infty)$; concave up on $(-\infty, 0)$
B) Local minimum at x = +1; local maximum at x = −1; concave down on $(-\infty, \infty)$
C) Local minimum at x = +1; local maximum at x = −1; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$
D) Local minimum at x = +1; local maximum at x = −1; concave up on $(-\infty, \infty)$

Find a value of a so that f is continuous at c, or indicate this is impossible.

111) $f(x) = \begin{cases} 5x - 3, & x < 0 \\ a, & x = 0;\ c = 0 \\ -3x + 4, & x > 0 \end{cases}$ 111) ______

A) 5 B) −3 C) Impossible D) −5

Solve the problem.

112) Given the acceleration, initial velocity, and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 112) ______
$a = 10$, $v(0) = -3$, $s(0) = 2$

A) $s = -5t^2 + 3t + 2$ B) $s = 5t^2 - 3t + 2$ C) $s = 5t^2 - 3t$ D) $s = 10t^2 - 3t + 2$

Answer each question appropriately.

113) If differentiable functions $y = F(x)$ and $y = G(x)$ both solve the initial value problem 113) ______
$\frac{dy}{dx} = f(x)$, $y(x_0) = y_0$, on an interval I, must $F(x) = G(x)$ for every x in I? Justify the answer.

A) F(x) and G(x) are not unique. There are infinitely many functions that solve the initial value problem. When solving the problem there is an integration constant C that can be any value. F(x) and G(x) could each have a different constant term.
B) F(x) = G(x) for every x in I because integrating f(x) results in one unique function.
C) F(x) = G(x) for every x in I because when given an initial condition, we can find the integration constant when integrating f(x). Therefore, the particular solution to the initial value problem is unique.
D) There is not enough information given to determine if F(x) = G(x).

Solve the initial value problem.

114) $\frac{d^3y}{dx^3} = 5;\ y''(0) = 5,\ y'(0) = 6,\ y(0) = 5$ 114) ______

A) $y = \frac{5}{3}x^3 + \frac{5}{2}x^2 + 6x + 5$ B) $y = 5$
C) $y = \frac{5}{6}x^3 + \frac{5}{2}x^2 + 6x + 5$ D) $y = \frac{5}{6}x^3 - \frac{5}{2}x^2 + 6$

Find an antiderivative of the given function.

115) $\cos \pi x + 2 \sin \frac{x}{2}$ 115) ______

A) $\frac{1}{\pi} \sin \pi x - 4 \cos \frac{x}{2}$ B) $-\pi \sin \pi x + \cos \frac{x}{2}$
C) $\frac{1}{\pi} \sin \pi x - \cos \frac{x}{2}$ D) $-\sin \pi x - 4 \cos \frac{x}{2}$

Solve the problem.

116) From a thin piece of cardboard 50 in. by 50 in., square corners are cut out so that the sides can be folded up to make a box. What dimensions will yield a box of maximum volume? What is the maximum volume? Round to the nearest tenth, if necessary. 116) ______

A) 33.3 in. by 33.3 in. by 8.3 in.; 9259.3 in.^{3} B) 16.7 in. by 16.7 in. by 16.7 in.; 4629.6 in.^{3}
C) 25 in. by 25 in. by 12.5 in.; 7812.5 in.^{3} D) 33.3 in. by 33.3 in. by 16.7 in.; 18,518.5 in.^{3}

117) A company is constructing an open-top, square-based, rectangular metal tank that will have a volume of 51 ft^3. What dimensions yield the minimum surface area? Round to the nearest tenth, if necessary. 117) ______

A) 4.7 ft by 4.7 ft by 2.3 ft B) 10.1 ft by 10.1 ft by 0.5 ft
C) 3.7 ft by 3.7 ft by 3.7 ft D) 5.3 ft by 5.3 ft by 1.8 ft

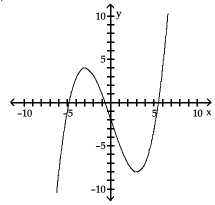
Find a value of a so that f is continuous at c, or indicate this is impossible.

118) $f(x) = \begin{cases} \frac{-5x + 20}{x - 4}, & x \neq 4 \\ a, & x = 4;\ c = 4 \end{cases}$ 118) ______

A) 20 B) Impossible C) 5 D) −5

Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down.

119) 119)



A) Local minimum at x = 3 ; local maximum at x = −3 ; concave up on (−∞, −3) and (3, ∞); concave down on (−3, 3)
B) Local minimum at x = 3 ; local maximum at x = −3 ; concave up on (0, ∞); concave down on (−∞, 0)
C) Local minimum at x = 3 ; local maximum at x = −3 ; concave down on (0, ∞); concave up on (−∞, 0)
D) Local minimum at x = 3 ; local maximum at x = −3 ; concave down on (−∞, −3) and (3, ∞); concave up on (−3, 3)

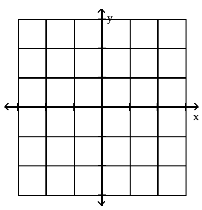
Use Newton's method to estimate the requested solution of the equation. Start with given value of x_0 and then give x_2 as the estimated solution.

120) $x^4 - 4x + 2 = 0$; $x_0 = 0$; Find the left-hand solution. 120) ______

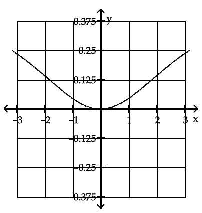
A) 0.5 B) 0.57 C) 0.51 D) 0.52

Sketch the graph and show all local extrema and inflection points.

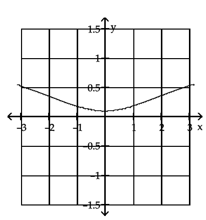
121) $f(x) = \frac{x^2}{x^2 + 10}$ 121)



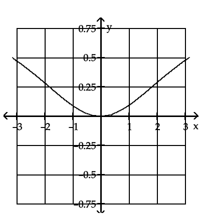
A) Min: (0,0)
No inflection point



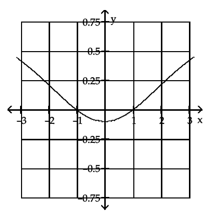
B) Min: $\left(0, \frac{1}{10}\right)$
No inflection point



C) Min: (0,0)
Inflection points: $\left(-\frac{\sqrt{30}}{3}, \frac{1}{4}\right), \left(\frac{\sqrt{30}}{3}, \frac{1}{4}\right)$



D) Min: $\left(0, -\frac{1}{10}\right)$
No inflection point



Find all possible functions with the given derivative.

122) $y' = 5 - \frac{1}{x^2}$ 122) ______

A) $5 - \frac{1}{x} + C$ B) $5x + \frac{1}{x} + C$ C) $5 + \frac{1}{x^2} + C$ D) $5x - \frac{1}{x} + C$

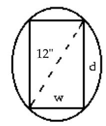
Use l'Hopital's Rule to evaluate the limit.

123) $\lim\limits_{x \to 1} \frac{x^3 - 10x^2 + 9}{x - 1}$ 123) ______

A) −17 B) 20 C) 23 D) 13

Solve the problem.

124) The stiffness of a rectangular beam is proportional to its width times the cube of its depth. Find the dimensions of the stiffest beam than can be cut from a 12-in.-diameter cylindrical log. (Round answers to the nearest tenth.) 124) ______



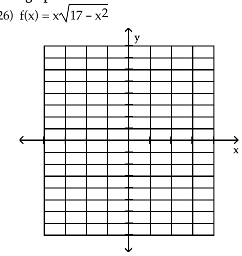
A) w = 7.0; d = 11.4 B) w = 5.0; d = 11.4 C) w = 6.0; d = 10.4 D) w = 7.0; d = 9.4

125) Find the number of units that must be produced and sold in order to yield the maximum profit, given the following equations for revenue and cost: 125) ______
$R(x) = 20x - 0.5x^2$
$C(x) = 7x + 4$.

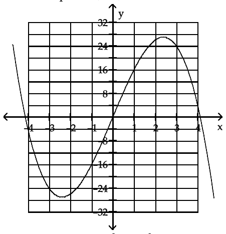
A) 27 units B) 17 units C) 13 units D) 14 units

Sketch the graph and show all local extrema and inflection points.

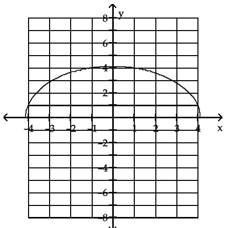
126) $f(x) = x\sqrt{17 - x^2}$ 126)



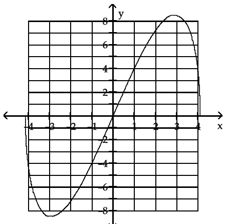
A) Local minimum: $\left(-\frac{\sqrt{51}}{3}, -\frac{2\cdot 17^{3/2}\sqrt{3}}{9}\right)$; local maximum: $\left(\frac{\sqrt{51}}{3}, \frac{2\cdot 17^{3/2}\sqrt{3}}{9}\right)$
Inflection point: (0, 0)



B) Local maximum at $\left(0, \sqrt{17}\right)$
No inflection points.

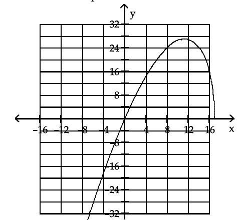


C) Local minimum: $\left(-\frac{\sqrt{34}}{2}, -\frac{17}{2}\right)$; local maximum: $\left(\frac{\sqrt{34}}{2}, \frac{17}{2}\right)$
Inflection point: (0, 0)



D) Local maximum: $\left(\frac{34}{3}, \frac{2\cdot 17^{3/2}\sqrt{3}}{9}\right)$

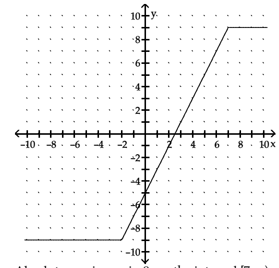
D) Local maximum: $\left(\frac{34}{3}, \frac{2\cdot 17^{3/2}\sqrt{3}}{9}\right)$
No inflection point.



Graph the function, then find the extreme values of the function on the interval and indicate where they occur.

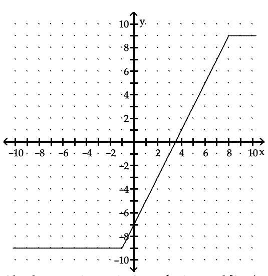
127) $y = |x + 2| - |x - 7|$ on the interval $-\infty < x < \infty$ 127)

A)



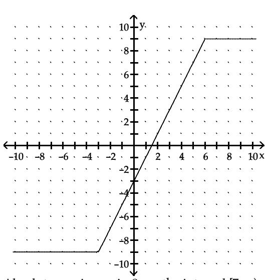
Absolute maximum is: 9, on the interval $[7, \infty)$; absolute minimum is: -9 on the interval $(-\infty, 2]$

B)



Absolute maximum is: 9, on the interval $[8, \infty)$; absolute minimum is: -9 on the interval $(-\infty, 1]$

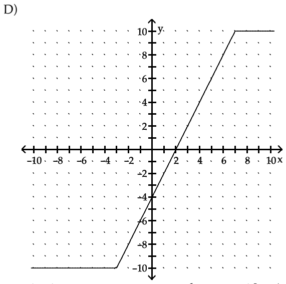
C)



Absolute maximum is: 8, on the interval $[7, \infty)$; absolute minimum is: -8 on the interval $(-\infty, 2]$

D)

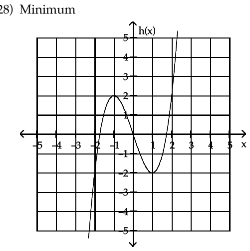
D)



Absolute maximum is: 10, on the interval $[7, \infty)$; absolute minimum is: -10 on the interval $(-\infty, 2]$

Find the location of the indicated absolute extremum for the function.

128) Minimum 128)



A) No minimum B) x = 1 C) x = 2 D) x = −1

Find the extreme values of the function and where they occur.

129) $y = \frac{7x}{x^2 + 1}$ 129) ______

A) The minimum value is 0 at x = 1. The maximum value is 0 at x = −1.
B) The minimum value is 0 at x = 0.
C) The maximum value is 0 at x = 0.
D) The minimum value is $-\frac{7}{2}$ at x = −1. The maximum value is $\frac{7}{2}$ at x = 1.

Use differentiation to determine whether the integral formula is correct.

130) $\int \sec^2\left(\frac{x-4}{7}\right)dx = -7\cot\left(\frac{x-4}{7}\right) + C$ 130) ______

A) No B) Yes

Find the absolute extreme values of each function on the interval.

131) $f(x) = \csc x, -\frac{\pi}{2} \le x \le \frac{3\pi}{2}$ 131) ______

A) Maximum value of 1 at $x = \pi$; minimum value of -1 at $x = \pi$

B) Maximum value of 0 at $x = -\pi$; minimum value of -1 at $x = \pi$

C) Maximum value: does not exist; minimum value: does not exist

D) Maximum value of -1 at $x = \pi$; minimum value of 1 at $x = 0$

Using the derivative of f(x) given below, determine the intervals on which f(x) is increasing or decreasing.

132) $f'(x) = x^{1/3}(x - 4)$ 132) ______

A) Decreasing on $(0, 4)$; increasing on $(-\infty, 0) \cup (4, \infty)$

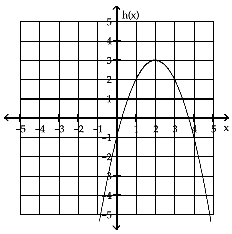
B) Increasing on $(0, \infty)$

C) Decreasing on $(0, 4)$; increasing on $(4, \infty)$

D) Decreasing on $(-\infty, 0) \cup (4, \infty)$; increasing on $(0, 4)$

Find the location of the indicated absolute extremum for the function.

133) Maximum 133)



A) $x = 2$ B) No maximum C) $x = -1$ D) $x = 0$

Use differentiation to determine whether the integral formula is correct.

134) $\int 4x(9x + 3)^3\, dx = \frac{1}{2}x^2(9x + 3)^4 + C$ 134) ______

A) No B) Yes

Identify the function's extreme values in the given domain, and say where they are assumed. Tell which of the extreme values, if any, are absolute.

135) $g(t) = \frac{t^3}{3} - 3.5t^2 + 12t,\ 0 \le t < \infty$ 135) ______

A) Local minimum: $\left(4, \frac{40}{3}\right)$; Local maximum: $\left(3, \frac{27}{2}\right)$; Absolute minimum: $\left(4, \frac{40}{3}\right)$

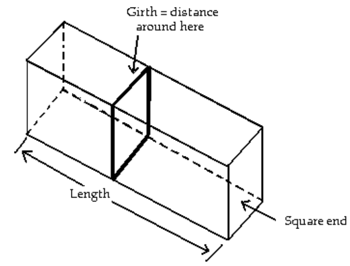
B) Local minimum: $\left(3, \frac{27}{2}\right)$; Local maximum: $\left(4, \frac{40}{3}\right)$; Absolute maximum: $\left(4, \frac{40}{3}\right)$

C) Local minimum: $\left(3, \frac{27}{2}\right)$; Local maxima: $(0, 0)$ and $\left(4, \frac{40}{3}\right)$; Absolute maximum: $\left(4, \frac{40}{3}\right)$

D) Local minima: $(0, 0)$ and $\left(4, \frac{40}{3}\right)$; Local maximum: $\left(3, \frac{27}{2}\right)$; Absolute minimum: $\left(4, \frac{40}{3}\right)$

Solve the problem.

136) A private shipping company will accept a box for domestic shipment only if the sum of its length and girth (distance around) does not exceed 108 in. What dimensions will give a box with a square end the largest possible volume? 136) ______



A) 18 in. x 36 in. x 36 in. B) 36 in. x 36 in. x 36 in.

C) 18 in. x 18 in. x 36 in. D) 18 in. x 18 in. x 90 in.

Determine the location of each local extremum of the function.

137) $f(x) = x^3 + 5.5x^2 - 4x - 1$ 137) ______

A) Local maximum at $\frac{-1}{3}$; local minimum at 4

B) Local maximum at $-\frac{4}{3}$; local minimum at 1

C) Local maximum at -4; local minimum at $\frac{1}{3}$

D) Local maximum at -1; local minimum at 1.33

Find all possible functions with the given derivative.

138) $y' = x^3 - 7x$ 138) ______

A) $\frac{x^4}{4} + 7x^2 + C$ B) $\frac{x^4}{4} - \frac{7x^2}{2} + C$ C) $3x^2 - 7 + C$ D) $\frac{x^3}{3} - \frac{7x^2}{2} + C$

Find an antiderivative of the given function.

139) $-\frac{24}{x^7}$ 139) ______

A) $\frac{6}{x^5}$ B) $\frac{4}{x^6}$ C) $-\frac{6}{x^4}$ D) $\frac{4}{x^7}$

Answer each question appropriately.

140) The position of an object in free fall near the surface of the plane where the acceleration due to gravity has a constant magnitude of g (length-units)/sec^2 is given by the equation: 140) ______

$s = -\frac{1}{2}gt^2 + v_0t + s_0$, where s is the height above the earth, v_0 is the initial velocity, and s_0 is the initial height. Give the initial value problem for this situation. Solve it to check its validity. Remember the positive direction is the upward direction.

A) $\frac{d^2s}{dt^2} = -g$ B) $\frac{d^2s}{dt^2} = -g,\ s'(0) = v_0,\ s(0) = s_0$

C) $\frac{d^2s}{dt^2} = -gt,\ s(0) = s_0$ D) $\frac{d^2s}{dt^2} = g,\ s'(0) = v_0,\ s(0) = s_0$

Using the derivative of f(x) given below, determine the critical points of f(x).

141) $f'(x) = (x + 7)(x + 8)$ 141) ______

A) $-8, -7$ B) -15 C) $0, -8, -7$ D) $7, 8$

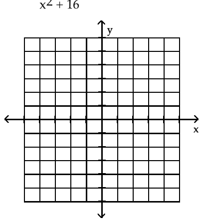
Find the largest open interval where the function is changing as requested.

142) Decreasing $f(x) = x^3 - 4x$ 142) ______

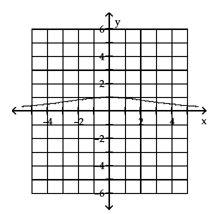
A) $\left(-\frac{2\sqrt{3}}{3}, \frac{2\sqrt{3}}{3}\right)$ B) $(-\infty, \infty)$ C) $\left(-\infty, -\frac{2\sqrt{3}}{3}\right)$ D) $\left(\frac{2\sqrt{3}}{3}, \infty\right)$

Sketch the graph and show all local extrema and inflection points.

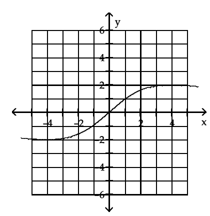
143) $f(x) = \frac{16x}{x^2 + 16}$ 143)



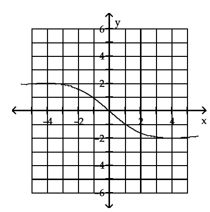
A) Maximum: (0,1)
No inflection point



B) Local minimum: (−4,−2)
Local maximum: (4,2)
Inflection point: (0,0), $(-4\sqrt{3}, -4\sqrt{3})$,$(4\sqrt{3}, 4\sqrt{3})$

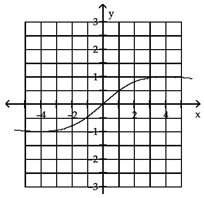


C) Local minimum: (4,−2)
Local maximum: (−4,2)
Inflection point: (0,0)



D) Local minimum: (−4,− 1)

D) Local minimum: (−4,− 1)
Local maximum: (4,1)
Inflection point: (0,0)



Solve the problem.

144) A rectangular field is to be enclosed on four sides with a fence. Fencing costs$2 per foot for two opposite sides, and $5 per foot for the other two sides. Find the dimensions of the field of area 610 ft^2 that would be the cheapest to enclose. 144) ______

A) 9.9 ft @ $2 by 61.7 ft @ $5
B) 39.1 ft @ $2 by 15.6 ft @ $5
C) 61.7 ft @ $2 by 9.9 ft @ $5
D) 15.6 ft @ $2 by 39.1 ft @ $5

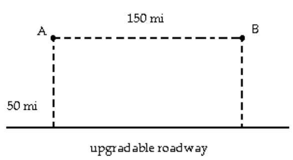
Use a computer algebra system (CAS) to solve the given initial value problem.

145) $y' = \dfrac{12(1 - x^2)}{1 + x^2}$, $y(0) = 4$ 145) ______

A) $y = 13 \tan^{-1} x - x + 4$
B) $y = 12 \ln\left(\dfrac{x+1}{|x-1|}\right) - 12x + 4$
C) $y = 24 \tan^{-1} x - 12x + 4$
D) $y = 24 \tan^{-1} x - 12x$

Solve the problem.

146) A highway must be constructed to connect Village A with Village B. There is a rudimentary roadway that can be upgraded 50 mi south of the line connecting the two villages. The cost of upgrading the existing roadway is $300,000 per mile, whereas the cost of constructing a new highway is $500,000 per mile. Find the combination of upgrading and new construction that minimizes the cost of connecting the two villages. 146) ______



A) $86,285,146
B) $85,000,000
C) $87,285,146
D) $83,714,854

Find a value of a so that f is continuous at c, or indicate this is impossible.

147) $f(x) = \begin{cases} \dfrac{16x - 4 \sin 4x}{3x^3}, & x \neq 0 \\ c, & x = 0 \end{cases}$ 147) ______

A) 0
B) 16
C) $\dfrac{128}{9}$
D) $\dfrac{32}{9}$

Solve the problem.

148) Given the velocity and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 148) ______

$v = \cos \dfrac{\pi}{2} t$, $s(0) = 1$

A) $s = \dfrac{2}{\pi} \sin \dfrac{\pi}{2} t$
B) $s = \dfrac{2}{\pi} \sin \dfrac{\pi}{2} t + \pi$
C) $s = \sin t$
D) $s = 2\pi \sin \dfrac{\pi}{2} t$

149) A small frictionless cart, attached to the wall by a spring, is pulled 10 cm back from its rest position and released at time t = 0 to roll back and forth for 4 sec. Its position at time t is $s = 1 - 10 \cos \pi t$. What is the cart's maximum speed? When is the cart moving that fast? What is the magnitude of of the acceleration then? 149) ______

A) $10\pi \approx 31.42$ cm/sec; t = 0.5 sec, 2.5 sec; acceleration is 1 cm/sec^2
B) $10\pi \approx 31.42$ cm/sec; t = 0.5 sec, 1.5 sec, 2.5 sec, 3.5 sec; acceleration is 0 cm/sec^2
C) $10\pi \approx 31.42$ cm/sec; t = 0 sec, 1 sec, 2 sec, 3 sec; acceleration is 0 cm/sec^2
D) $\pi \approx 3.14$ cm/sec; t = 0.5 sec, 1.5 sec, 2.5 sec, 3.5 sec; acceleration is 0 cm/sec^2

Find the most general antiderivative.

150) $\displaystyle\int \frac{\sec \theta}{\sec \theta - \cos \theta}\, d\theta$ 150) ______

A) $\cos^2 \theta + C$
B) $\cot \theta + C$
C) $-\cot \theta + C$
D) $\theta + \tan \theta + C$

Use l'Hopital's Rule to evaluate the limit.

151) $\displaystyle\lim_{x \to \frac{\pi}{3}} \frac{\cos x - \frac{1}{2}}{x - \frac{\pi}{3}}$ 151) ______

A) $-\sqrt{3}$
B) $-\dfrac{\sqrt{3}}{2}$
C) $\dfrac{\sqrt{2}}{2}$
D) $\dfrac{\sqrt{3}}{2}$

Solve the problem.

152) The velocity of a particle (in $\frac{ft}{s}$) is given by $v = t^2 - 5t + 2$, where t is the time (in seconds) for which it has traveled. Find the time at which the velocity is at a minimum. 152) ______

A) 1 s
B) 5 s
C) 2.5 s
D) 2 s

Find all possible functions with the given derivative.

153) $y' = 6x^2 + 1$ 153) ______

A) $2x^3 + x + C$
B) $12x + C$
C) $x + C$
D) $2x^3 + C$

Find the largest open interval where the function is changing as requested.

154) Increasing $y = (x^2 - 9)^2$ 154) ______

A) $(-\infty, 0)$
B) $(-3, 0)$
C) $(-3, 3)$
D) $(3, \infty)$

Determine whether the function satisfies the hypotheses of the Mean Value Theorem for the given interval.

155) $f(x) = x^{1/3}$, $[-1,1]$ 155) ______

A) No
B) Yes

Find the most general antiderivative.

156) $\displaystyle\int (-7 \sec^2 x)\, dx$ 156) ______

A) $-7 \cot x + C$
B) $-7 \tan x + C$
C) $7 \cot x + C$
D) $\dfrac{\tan x}{7} + C$

Use the maximum/minimum finder on a graphing calculator to determine the approximate location of all local extrema.

157) $f(x) = 0.1x^4 - x^3 - 15x^2 + 59x + 14$ 157) ______

A) Approximate local maximum at 1.831; approximate local minima at −6.691 and 12.616
B) Approximate local maximum at 1.75; approximate local minima at −6.704 and 12.447
C) Approximate local maximum at 1.735; approximate local minima at −6.777 and 12.542
D) Approximate local maximum at 1.781; approximate local minima at −6.813 and 0.069

Find the derivative at each critical point and determine the local extreme values.

158) $y = x^{2/3}(x^2 - 4)$; $x \geq 0$ 158) ______

A)

Critical Pt.	derivative	Extremum	Value
x = 0	0	maximum	0
x = 1	0	minimum	−3

B)

Critical Pt.	derivative	Extremum	Value
x = 0	Undefined	local max	0
x = 1	0	minimum	−3

C)

Critical Pt.	derivative	Extremum	Value
x = 0	Undefined	local max	2
x = 1	0	minimum	−3

D)

Critical Pt.	derivative	Extremum	Value
x = 0	Undefined	local max	0
x = 1	0	minimum	5

Find a value of a so that f is continuous at c, or indicate this is impossible.

159) Let $f(x) = (\sin x)^x$, $x \neq 0$. Extend the definition of f to x = 0 so that the extended function is continuous there. 159) ______

A) $f(x) = \begin{cases} (\sin x)^x, & x \neq 0 \\ e, & x = 0 \end{cases}$
B) $f(x) = \begin{cases} (\sin x)^x, & x \neq 0 \\ -1, & x = 0 \end{cases}$
C) $f(x) = \begin{cases} (\sin x)^x, & x \neq 0 \\ 0, & x = 0 \end{cases}$
D) $f(x) = \begin{cases} (\sin x)^x, & x \neq 0 \\ 1, & x = 0 \end{cases}$

Find all possible functions with the given derivative.

160) $y' = \dfrac{7}{2\sqrt{t}}$ 160) ______

A) $\dfrac{7t}{2} + C$
B) $7\sqrt{t} + C$
C) $\sqrt{t} + C$
D) $\dfrac{7t^2}{2} + C$

Use Newton's method to estimate the requested solution of the equation. Start with given value of x_0 and then give x_2 as the estimated solution.

161) $-x^2 + 4x - 1 = 0$; $x_0 = 0$; Find the left-hand solution. 161) ______

A) 0.25
B) 0.23
C) −0.33
D) 0.14

Find the extreme values of the function and where they occur.

162) $y = \dfrac{x+1}{x^2 + 3x + 3}$ 162) ______

A) The maximum is $\frac{1}{3}$ at x = 0; the minimum is − 1 at x = −2.
B) None
C) The maximum is $-\frac{1}{3}$ at x = 0; the minimum is 1 at x = −2.
D) The maximum is 3 at x = 0; the minimum is $\frac{1}{3}$ at x = −2.

Determine the location of each local extremum of the function.

163) $f(x) = -x^3 - 4.5x^2 - 6x + 2$ 163) ______

A) Local maximum at −2; local minimum at −1
B) Local maximum at 2; local minimum at 1
C) Local maximum at −1; local minimum at −2
D) Local maximum at 1; local minimum at 2

Use Newton's method to estimate the requested solution of the equation. Start with given value of x_0 and then give x_2 as the estimated solution.

164) $x^4 - 3 = 0$; $x_0 = 1$; Find the negative solution. 164) ______

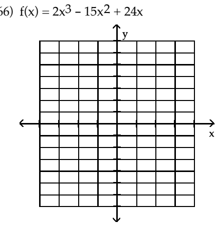
A) 1.29
B) 1.31
C) 1.33
D) 1.32

165) $x^3 + 5x + 2 = 0$; $x_0 = -1$; Find the one real solution. 165) ______

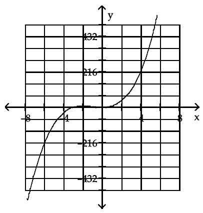
A) −0.38
B) −0.44
C) −0.39
D) −0.64

Sketch the graph and show all local extrema and inflection points.

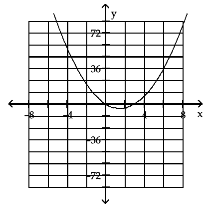
166) $f(x) = 2x^3 - 15x^2 + 24x$ 166)



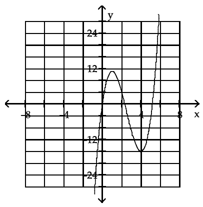
A) Local maximum: $(0, 0)$
Local minimum: $(2, -8)$
Inflection point: $(1, -4)$



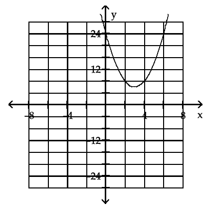
B) No extrema
Inflection point: $(0, 0)$



C) Local max: $(1, 11)$, min: $(4, -16)$
Inflection point: $\left(\frac{5}{2}, -\frac{5}{2}\right)$



D) Local min: $(3, 6)$
No inflection point



Find the extreme values of the function and where they occur.

167) $y = x^3 - 3x^2 + 1$ 167) ______

A) Local maximum at (0, 1), local minimum at (2, –3).
B) Local minimum at (2, –3).
C) None
D) Local maximum at (0, 1).

Use differentiation to determine whether the integral formula is correct.

168) $\int (5x+7)^4\,dx = \frac{(5x+7)^5}{25} + C$ 168) ______

A) Yes B) No

Find all possible functions with the given derivative.

169) $y' = 5t - \frac{2}{\sqrt{t}}$ 169) ______

A) $5t^2 - 4\sqrt{t} + C$ B) $t^2 - 2\sqrt{t} + C$ C) $5t^2 - \frac{2}{\sqrt{t}} + C$ D) $\frac{5}{2}t^2 - 4\sqrt{t} + C$

Find an antiderivative of the given function.

170) $3 \csc 4x \cot 4x$ 170) ______

A) $-\frac{3}{4}\cot 4x$ B) $-\frac{3}{4}\csc 4x$ C) $\frac{3}{4}\csc 4x$ D) $-3\csc 4x$

Use l'Hopital's Rule to evaluate the limit.

171) $\lim\limits_{x \to -\infty} \frac{8 - 5x - 18x^2}{14 + 7x - 8x^2}$ 171) ______

A) ∞ B) 1 C) $\frac{4}{7}$ D) $\frac{9}{4}$

L'Hopital's rule does not help with the given limit. Find the limit some other way.

172) $\lim\limits_{x \to 0^+} \frac{1}{\cot x \ \sin x}$ 172) ______

A) ∞ B) –1 C) 1 D) 0

173) $\lim\limits_{x \to \infty} \frac{9x^2 - 5x + 1}{6x^2 + 3x - 8}$ 173) ______

A) 9 B) ∞ C) 1 D) $\frac{3}{2}$

174) $\lim\limits_{x \to 0^+} \frac{\sec x}{\tan x}$ 174) ______

A) ∞ B) –1 C) 1 D) 0

Find the most general antiderivative.

175) $\int (\sqrt{t} - \sqrt[7]{t})\,dt$ 175) ______

A) $\sqrt{t} - \sqrt[6]{t} + C$ B) $\frac{3}{2}t^{3/2} - \frac{8}{7}t^{8/7} + C$
C) $\frac{2}{3}t^{3/2} - \frac{7}{8}t^{8/7} + C$ D) $\frac{-1}{2}t^{1/2} - \frac{1}{7}t^{-6/7} + C$

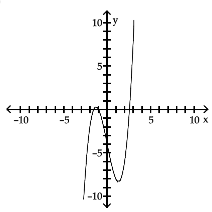
Use differentiation to determine whether the integral formula is correct.

176) $\int (5x-4)^4\,dx = \frac{(5x-4)^5}{25} + C$ 176) ______

A) Yes B) No

Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down.

177) 177)



A) Local minimum at $x = +1.29$,; local maximum at $x = -1.29$; concave down on $(0, \infty)$; concave up on $(-\infty, 0)$
B) Local minimum at $x = -1.29$,; local maximum at $x = +1.29$; concave up on $(-\infty, -1.29)$ and $(1.29, \infty)$; concave down on $(-1.29, 1.29)$
C) Local minimum at $x = +1.29$,; local maximum at $x = -1.29$; concave up on $(-\infty, -1.29)$ and $(1.29, \infty)$; concave down on $(-1.29, 1.29)$
D) Local minimum at $x = +1.29$,; local maximum at $x = -1.29$; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$

Solve the initial value problem.

178) $\frac{dr}{d\theta} = -\frac{\pi}{2}\cos\frac{\pi}{2}\theta,\ r(0) = -6$ 178) ______

A) $r = -\frac{\pi}{2}\sin\frac{\pi}{2}\theta - 6$ B) $r = \sin\frac{\pi}{2}\theta - 6$
C) $r = \cos\frac{\pi}{2}\theta - 7$ D) $r = -\sin\frac{\pi}{2}\theta - 6$

Solve the problem.

179) The acceleration of gravity near the surface of Mars is $3.72\ m/sec^2$. If a rock is blasted straight up from the surface with an initial velocity of 85 m/sec (about 190 mph), how high does it go? (Hint: When is velocity zero?) 179) ______

A) Approximately 971.1 meters B) Approximately 1942.25 meters
C) Approximately 22.85 meters D) Approximately 170 meters

Determine whether the function satisfies the hypotheses of the Mean Value Theorem for the given interval.

180) $g(x) = x^{3/4}$, $[0, 3]$ 180) ______

A) No B) Yes

Find the absolute extreme values of each function on the interval.

181) $f(x) = \csc x,\ -\frac{\pi}{2} \le x \le \frac{3\pi}{2}$ 181) ______

A) Maximum value: does not exist; minimum value: does not exist
B) Maximum value of 1 at $x = \pi$; minimum value of –1 at $x = \pi$
C) Maximum value of 0 at $x = -\pi$; minimum value of –1 at $x = \pi$
D) Maximum value of 0 at $x = 1$; minimum value of –1 at $x = \pi$

Find the derivative at each critical point and determine the local extreme values.

182) $y = \begin{cases} 5 - 2x, & x \le 1 \\ x + 2, & x > 1 \end{cases}$ 182) ______

A)

Critical Pt.	derivative	Extremum	Value
x = 0	0	minimum	4

B)

Critical Pt.	derivative	Extremum	Value
x = 1	undefined	minimum	3

C)

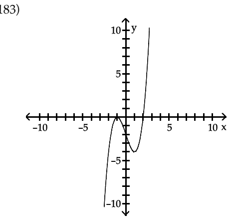
Critical Pt.	derivative	Extremum	Value
x = 2	undefined	minimum	4

D)

Critical Pt.	derivative	Extremum	Value
x = 1	0	minimum	3

Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down.

183) 183)



A) Local maximum at $x = +1$; local minimum at $x = -1$; concave up on $(-\infty, \infty)$
B) Local minimum at $x = +1$; local maximum at $x = -1$; concave down on $(0, \infty)$; concave up on $(-\infty, 0)$
C) Local minimum at $x = +1$; local maximum at $x = -1$; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$
D) Local maximum at $x = +1$; local minimum at $x = -1$; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$

Find the largest open interval where the function is changing as requested.

184) Decreasing $f(x) = |x - 8|$ 184) ______

A) $(-\infty, -8)$ B) $(-8, \infty)$ C) $(8, \infty)$ D) $(-\infty, 8)$

Determine whether the function satisfies the hypotheses of the Mean Value Theorem for the given interval.

185) $f(\theta) = \begin{cases} \dfrac{\cos\theta}{\theta}, & -\pi \le \theta < 0 \\ 0, & \theta = 0 \end{cases}$ 185) ______

A) No B) Yes

Find a value of a so that f is continuous at c, or indicate this is impossible.

186) $f(x) = \begin{cases} \dfrac{-4}{x^2}, & x < 0 \\ a, & x = 0;\ c = 0 \\ -4x, & x > 0 \end{cases}$ 186) ______

A) −4 B) Impossible C) 16 D) 4

Use the maximum/minimum finder on a graphing calculator to determine the approximate location of all local extrema.

187) $f(x) = x^5 - 15x^4 - 3x^3 - 172x^2 + 135x + 0.005$ 187) ______

A) Approximate local maximum at 0.432; approximate local minimum at −12.549

B) Approximate local maximum at 0.379; approximate local minima at −0.472 and 12.565

C) Approximate local maximum at 0.323; approximate local minima at −0.409 and −12.576

D) Approximate local maximum at 0.379; approximate local minimum at 12.565

Solve the initial value problem.

188) $\dfrac{dy}{dx} = \dfrac{1}{x^3} + x,\ x > 0;\ y(2) = 1$ 188) ______

A) $y = -\dfrac{1}{2x^2} + \dfrac{9}{8}$

B) $y = -\dfrac{1}{2x^2} + \dfrac{x^2}{2} - \dfrac{7}{8}$

C) $y = \dfrac{4}{x^4} + \dfrac{x^2}{2} - \dfrac{5}{4}$

D) $y = \dfrac{-1}{2x^2} + \dfrac{x^2}{2}$

Use l'Hôpital's rule to find the limit.

189) $\lim\limits_{x\to\infty} x \sin \dfrac{10}{x}$ 189) ______

A) 0 B) 1 C) 10 D) $\dfrac{1}{10}$

190) $\lim\limits_{x\to\infty} \left(\sqrt{x^2 + 5x} - x\right)$ 190) ______

A) 5 B) $-\dfrac{5}{2}$ C) 0 D) $\dfrac{5}{2}$

Find all possible functions with the given derivative.

191) $y' = 5x^7$ 191) ______

A) $\dfrac{1}{4}x^8 + C$ B) $\dfrac{7}{5}x^8 + C$ C) $\dfrac{5}{8}x^8 + C$ D) $\dfrac{5}{7}x^8 + C$

Find the function with the given derivative whose graph passes through the point P.

192) $r'(\theta) = 4 + \sec^2\theta,\ P(0, 0)$ 192) ______

A) $r(\theta) = 4\theta + \tan\theta$

B) $r'(\theta) = 2\theta^2 + \tan\theta$

C) $r(\theta) = 2\theta^2 + \tan\theta$

D) $r(\theta) = 4\theta + \dfrac{1}{3}\sec^3\theta$

Solve the problem.

193) You are driving along a highway at a steady 71 ft/sec when you see a deer ahead and slam on the brakes. What constant deceleration is required to stop your car in 300 ft? 193) ______

A) 16.80 ft/sec^2 B) 0.12 ft/sec^2 C) 8.40 ft/sec^2 D) 4.20 ft/sec^2

Solve the initial value problem.

194) $\dfrac{dr}{dt} = 9t + \sec^2 t,\ r(-\pi) = -5$ 194) ______

A) $r = 9 + \tan t - 14$

B) $r = 9t^2 + \tan t - 5 - 9\pi^2$

C) $r = \dfrac{9}{2}t^2 + \tan t - 5 - \dfrac{9}{2}\pi^2$

D) $r = \dfrac{9}{2}t^2 + \cot t - 5 - \dfrac{9}{2}\pi^2$

Solve the problem.

195) A rocket lifts off the surface of Earth with a constant acceleration of 30 m/sec^2. How fast will the rocket be going 2.5 minutes later? 195) ______

A) 187.5 m/sec B) 75 m/sec C) −75 m/sec D) 37.5 m/sec

Find the largest open interval where the function is changing as requested.

196) Decreasing $f(x) = \sqrt{4 - x}$ 196) ______

A) $(4, \infty)$ B) $(-4, \infty)$ C) $(-\infty, 4)$ D) $(-\infty, -4)$

Find all possible functions with the given derivative.

197) $y' = 7x^2 - 5x$ 197) ______

A) $\dfrac{7}{3}x^2 + \dfrac{5}{2}x + C$

B) $-\dfrac{7}{3}x^3 - \dfrac{5}{2}x^2 + C$

C) $\dfrac{7}{3}x^3 - \dfrac{5}{2}x^2 + C$

D) $\dfrac{7}{3}x^3 + C$

Use the maximum/minimum finder on a graphing calculator to determine the approximate location of all local extrema.

198) $f(x) = x^4 - 4x^3 - 53x^2 - 86x - 31$ 198) ______

A) Approximate local maximum at 0.895; approximate local minima at −3.256 and 7.152

B) Approximate local maximum at 0.926; approximate local minima at −3.275 and 7.16

C) Approximate local maximum at 0.97; approximate local minima at −3.194 and −0.087

D) Approximate local maximum at −0.944; approximate local minima at −3.192 and 7.136

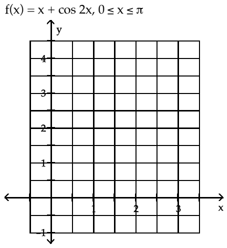
Solve the problem.

199) On our moon, the acceleration of gravity is 1.6 m/sec^2. If a rock is dropped into a crevasse, how fast will it be going just before it hits bottom 45 seconds later? 199) ______

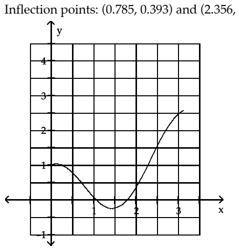
A) 72 m/sec B) −36 m/sec C) −72 m/sec D) 3240 m/sec

Sketch the graph and show all local extrema and inflection points.

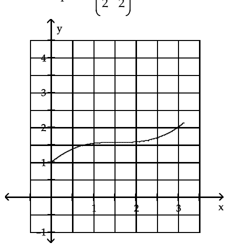
200) $f(x) = x + \cos 2x,\ 0 \le x \le \pi$ 200)



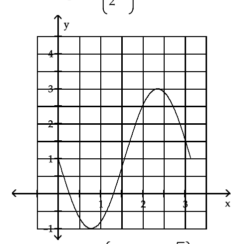
A) Local minimum: (1.444, −0.246); local maximum: (0.126, 1.031)
Inflection points: (0.785, 0.393) and (2.356, 1.178)



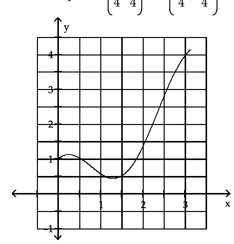
B) No local extrema.
Inflection point: $\left(\dfrac{\pi}{2}, \dfrac{\pi}{2}\right)$



C) Local minimum: $\left(\dfrac{\pi}{4}, -1\right)$; local maximum: $\left(\dfrac{3\pi}{4}, 3\right)$
Inflection point: $\left(\dfrac{\pi}{2}, 1\right)$

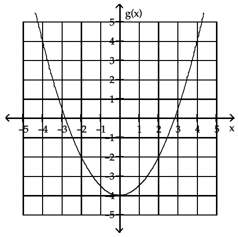


D) Local minimum: $\left(\dfrac{5\pi}{12}, \dfrac{5\pi - 6\sqrt{3}}{12}\right)$; local maximum: $\left(\dfrac{\pi}{12}, \dfrac{\pi + 6\sqrt{3}}{12}\right)$
Inflection points: $\left(\dfrac{\pi}{4}, \dfrac{\pi}{4}\right)$ and $\left(\dfrac{3\pi}{4}, \dfrac{3\pi}{4}\right)$



Find the location of the indicated absolute extremum for the function.

201) Maximum 201)



A) No maximum B) $x = 0$ C) $x = \frac{11}{4}$ D) $x = -4$

Use l'Hopital's Rule to evaluate the limit.

202) $\lim\limits_{x \to -9} \frac{x^2 - 81}{x + 9}$ 202) ______

A) 18 B) −18 C) 9 D) −9

Find the absolute extreme values of each function on the interval.

203) $f(x) = \cos\left(x - \frac{\pi}{8}\right)$, $0 \le x \le \frac{7\pi}{4}$ 203) ______

A) Maximum value of 1 at $x = -\frac{\pi}{8}$; minimum value of −1 at $x = -\frac{9}{8}\pi$

B) Maximum value of 1 at $x = \frac{\pi}{8}$; minimum value of −1 at $x = \frac{9}{8}\pi$

C) Maximum value of 1 at $x = -\frac{\pi}{8}$; minimum value of −1 at $x = \frac{9}{8}\pi$

D) Maximum value of 1 at $x = \frac{\pi}{8}$; minimum value of −1 at $x = \frac{7}{8}\pi$

204) $F(x) = -\frac{3}{x^2}$, $0.5 \le x \le 3$ 204) ______

A) Maximum = $\left(3, -\frac{1}{3}\right)$; minimum = $\left(-\frac{1}{2}, -12\right)$

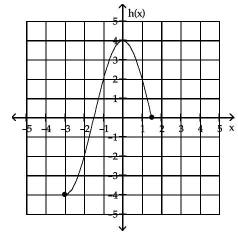
B) Maximum = $\left(\frac{1}{2}, -\frac{1}{3}\right)$; minimum = $(-3, -12)$

C) Maximum = $\left(3, -\frac{1}{3}\right)$; minimum = $\left(\frac{1}{2}, -12\right)$

D) Maximum = $\left(\frac{1}{2}, \frac{1}{3}\right)$; minimum = $(3, -12)$

Find the location of the indicated absolute extremum for the function.

205) Minimum 205)



A) $x = -3$ B) $x = -4$ C) $x = 2$ D) $x = 0$

Find the largest open interval where the function is changing as requested.

206) Increasing $f(x) = \frac{1}{x^2 + 1}$ 206) ______

A) $(-\infty, 1)$ B) $(-\infty, 0)$ C) $(1, \infty)$ D) $(0, \infty)$

Solve the problem.

207) A bookstore has an annual demand for 67,000 copies of a best-selling book. It costs \$0.1 to store one copy for one year, and it costs \$125 to place an order. Find the optimum number of copies per order. 207) ______

A) 12,942 copies B) 11,648 copies C) 40,927 copies D) 26,935 copies

Use the maximum/minimum finder on a graphing calculator to determine the approximate location of all local extrema.

208) $f(x) = 0.1x^5 + 5x^4 - 8x^3 - 15x^2 - 6x - 17$ 208) ______

A) Approximate local maxima at −41.106 and −0.203; approximate local minima at −0.642 and 2.047

B) Approximate local maxima at −41.132 and −0.273; approximate local minima at −0.547 and 1.952

C) Approximate local maxima at −41.149 and −0.231; approximate local minima at −0.542 and 1.994

D) Approximate local maxima at −41.052 and −0.355; approximate local minima at −0.576 and 1.872

Solve the problem.

209) A 43-in. piece of string is cut into two pieces. One piece is used to form a circle and the other to form a square. How should the string be cut so that the sum of the areas is a minimum? Round to the nearest tenth, if necessary. 209) ______

A) Square piece = 10.4 in., circle piece = 32.6 in.

B) Circle piece = 10.4 in., square piece = 32.6 in.

C) Square piece = 10.6 in., circle piece = 10.1 in.

D) Square piece = 0 in., circle piece = 43 in.

Find an antiderivative of the given function.

210) $12x^2 + 6x - 6$ 210) ______

A) $4x^3 + 3x^2 - 6x$ B) $4x^3 + 3x^2 - 5x$ C) $5x^3 + 3x^2 - 6x$ D) $4x^3 + 4x^2 - 6x$

Find all possible functions with the given derivative.

211) $y' = \csc^2 2\theta$ 211) ______

A) $\frac{1}{4}\csc 2\theta + C$ B) $-\frac{1}{2}\cot 2\theta + C$ C) $-\frac{1}{6}\csc^3 2\theta + C$ D) $-2\cot 2\theta + C$

Solve the problem.

212) If the price charged for a candy bar is $p(x)$ cents, then x thousand candy bars will be sold in a certain city, where $p(x) = 70 - \frac{x}{18}$. How many candy bars must be sold to maximize revenue? 212) ______

A) 630 candy bars B) 1260 thousand candy bars

C) 1260 candy bars D) 630 thousand candy bars

Solve the initial value problem.

213) $\frac{d^2y}{dx^2} = 1 - 8x$, $y'(0) = 8$, $y(0) = 2$ 213) ______

A) $y = 2$ B) $y = \frac{1}{2}x^2 - \frac{4}{3}x^3 + 8x + 2$

C) $y = 1x^2 + 8x^3 + 8x + 2$ D) $y = \frac{1}{2}x^2 + \frac{4}{3}x^3 - 8x - 2$

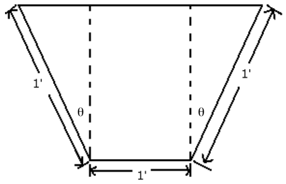
Find the most general antiderivative.

214) $\int \sin\theta(\cot\theta + \csc\theta)\,d\theta$ 214) ______

A) $\cos\theta + C$ B) $\sin\theta + \theta + C$ C) $\csc\theta + \cos\theta + C$ D) $\sin\theta + C$

Solve the problem.

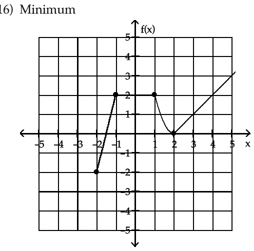
215) A trough is to be made with an end of the dimensions shown. The length of the trough is to be 25 feet long. Only the angle θ can be varied. What value of θ will maximize the trough's volume? 215) ______



A) 5 B) 55 C) 30° D) 32°

Find the location of the indicated absolute extremum for the function.

216) Minimum 216)



A) $x = -2$ B) $x = 2$ C) $x = 1$ D) $x = -1$

Answer each question appropriately.

217) Suppose the velocity of a body moving along the s-axis is $\frac{ds}{dt} = 9.8t - 8$. 217) ______

Is it necessary to know the initial position of the body to find the body's displacement over some time interval? Justify your answer.

A) Yes, knowing the initial position is the only way to find the exact positions at the beginning and end of the time interval. Those positions are needed to find the displacement.

B) Yes, integration is not possible without knowing the initial position.

C) No, displacement has nothing to do with the position of the body.

D) No, the initial position is necessary to find the curve s= f(t) but not necessary to find the displacement. The initial position determines the integration constant. When finding the displacement the integration constant is subtracted out.

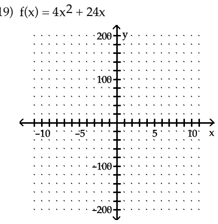
L'Hopital's rule does not help with the given limit. Find the limit some other way.

218) $\lim\limits_{x \to 0} \frac{\sin 7x}{3x}$ 218) ______

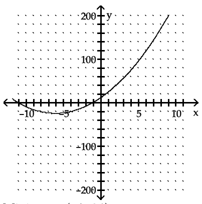
A) $\frac{7}{3}$ B) 1 C) 0 D) $\frac{1}{3}$

Sketch the graph and show all local extrema and inflection points.

219) $f(x) = 4x^2 + 24x$ 219)

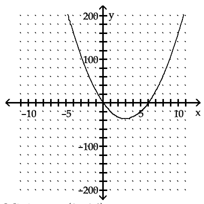


A)



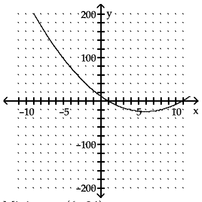
Minimum: (–6,–24)
No inflection points

B)



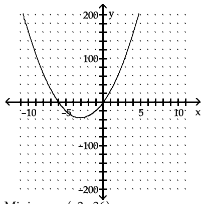
Minimum: (3,–36)
No inflection points

C)



Minimum: (6,–24)
No inflection points

D)



Minimum: (–3,–36)
No inflection points

Find the extreme values of the function and where they occur.

220) $y = \dfrac{1}{x^2 - 1}$ 220) ______

A) None
B) Local maximum at (1, 0), local minimum at (–1, 0).
C) Local maximum at (–1, 0), local minimum at (1,0).
D) Local maximum at (0, –1).

Solve the problem.

221) A baseball team is trying to determine what price to charge for tickets. At a price of \$10 per ticket, it averages 45,000 people per game. For every increase of \$1, it loses 5,000 people. Every person at the game spends an average of \$5 on concessions. What price per ticket should be charged in order to maximize revenue? 221) ______

A) \$13.00 B) \$3.00 C) \$4.00 D) \$7.00

Find all possible functions with the given derivative.

222) $y' = x^{10}$ 222) ______

A) $\frac{1}{10}x^9 + C$ B) $\frac{1}{11}x^{11} + C$ C) $10x^9 + C$ D) $11x^{11} + C$

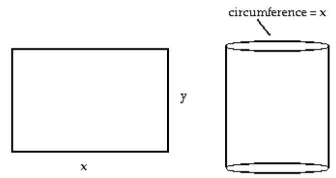
L'Hopital's rule does not help with the given limit. Find the limit some other way.

223) $\lim\limits_{x\to 0^+} \dfrac{\tan x}{\sec x}$ 223) ______

A) –1 B) 1 C) 0 D) ∞

Solve the problem.

224) A rectangular sheet of perimeter 36 cm and dimensions x cm by y cm is to be rolled into a cylinder as shown in part (a) of the figure. What values of x and y give the largest volume? 224) ______



A) x = 14 cm; y = 4 cm B) x = 13 cm; y = 5 cm
C) x = 12 cm; y = 6 cm D) x = 11 cm; y = 7 cm

Use the maximum/minimum finder on a graphing calculator to determine the approximate location of all local extrema.

225) $f(x) = x^4 - 3x^3 - 21x^2 + 74x - 87$ 225) ______

A) Approximate local maximum at 1.704; approximate local minima at –3.017 and –0.033
B) Approximate local maximum at 1.583; approximate local minima at –3.045 and 3.799
C) Approximate local maximum at 1.604; approximate local minima at –3.089 and 3.735
D) Approximate local maximum at 1.535; approximate local minima at –3.098 and 3.774

Solve the problem.

226) Given the acceleration, initial velocity, and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 226) ______
$a = 10 \cos 4t$, $v(0) = -3$, $s(0) = 10$

A) $s = -\frac{5}{8}\sin 4t - 3t + 10$ B) $s = \frac{5}{8}\sin 4t - 3t + 10$
C) $s = \frac{5}{8}\cos 4t + 3t + 10$ D) $s = -\frac{5}{8}\cos 4t - 3t + 10$

Find the function with the given derivative whose graph passes through the point P.

227) $g'(x) = \dfrac{4}{x^2} + 6x$, P(–2, 2) 227) ______

A) $g(x) = -4x^{-1} + 3x^2 - 12$ B) $g(x) = 4x^2 + 3x^2 - 12$
C) $g(x) = -4x^{-1} + 3x^2$ D) $g(x) = 4x^{-2} + 6x - 12$

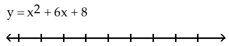
Use differentiation to determine whether the integral formula is correct.

228) $\int x \cos x \, dx = \dfrac{x^2}{2}\sin x + C$ 228) ______

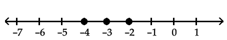
A) No B) Yes

Plot the zeros of the given polynomial on the number line together with the zeros of the first derivative.

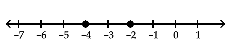
229) $y = x^2 + 6x + 8$ 229)



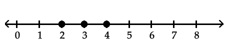
A)



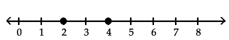
B)



C)

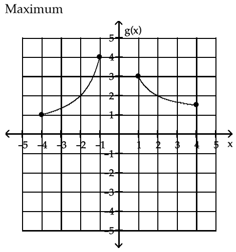


D)



Find the location of the indicated absolute extremum for the function.

230) Maximum 230)



A) x = 1 B) No maximum C) x = –1 D) x = 4

Solve the initial value problem.

231) $\dfrac{dv}{dt} = \dfrac{1}{3}\csc t \cot t$, $v\left(\dfrac{3\pi}{2}\right) = 1$ 231) ______

A) $v = \csc t + 0$ B) $v = -\frac{\csc t}{3} + \frac{2}{3}$ C) $v = -\frac{\csc t}{3} + \frac{4}{3}$ D) $v = -\frac{\sec t}{3} + 1$

Solve the problem.

232) A particle moves on a coordinate line with acceleration $a = d^2s/dt^2 = \left(5/\sqrt{t}\right) + 9\sqrt{t}$, subject to the conditions that $ds/dt = 3$ and $s = 1$ when $t = 1$. Find the velocity $v = ds/dt$ in terms of t and the position s in terms of t. 232) ______

A) $v = 10\sqrt[3]{t} + 6\sqrt[3]{t} - 13$; $s = \frac{20}{3}\sqrt[5]{t} + \frac{12}{5}\sqrt[3]{t} - 13t + \frac{74}{15}$

B) $v = 10\sqrt{t} - 6\sqrt[3]{t} + 13$; $s = \frac{20}{3}\sqrt[3]{t} - \frac{12}{5}\sqrt[5]{t} + 13t + \frac{74}{15}$

C) $v = 10\sqrt{t} + 6\sqrt[3]{t} - 13$; $s = \frac{20}{3}\sqrt[3]{t} + \frac{12}{5}\sqrt[5]{t} - 13t + \frac{74}{15}$

D) $v = \frac{20}{3}\sqrt[3]{t} + \frac{12}{5}\sqrt[5]{t} - 13t + \frac{74}{15}$; $s = 10\sqrt{t} + 6\sqrt[3]{t} - 13$

233) Given the velocity and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 233) ______
$v = \dfrac{8}{\pi}\sin\dfrac{4t}{\pi}$, $s(\pi^2) = 2$

A) $s = -2\cos\frac{4t}{\pi} + 4$ B) $s = -2\cos\frac{4t}{\pi} + 8.2134$
C) $s = -2\cos\frac{4t}{\pi} + 3.3073$ D) $s = 2\cos\frac{4t}{\pi} + 4$

Find the function with the given derivative whose graph passes through the point P.

234) $f'(x) = x - 4$, P(1, 7) 234) ______

A) $f(x) = \frac{x^2}{2} - 4x + \frac{23}{2}$ B) $f(x) = \frac{x^2}{2} - 4x + \frac{21}{2}$
C) $f(x) = x^2 - 4x$ D) $f(x) = x^2 - 4x + 10$

Solve the problem.

235) Given the velocity and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 235) ______
$v = \cos\dfrac{\pi}{2}t$, $s(0) = 1$

A) $s = \frac{2}{\pi}\sin\frac{\pi}{2}t + 1$ B) $s = \frac{2}{\pi}\sin\frac{\pi}{2}t + \pi$ C) $s = \sin t + 1$ D) $s = 2\pi\sin\frac{\pi}{2}t$

Find all possible functions with the given derivative.

236) $r' = 7 + \dfrac{1}{\theta^4}$ 236) ______

A) $r = 7\theta + \theta^4$ B) $r = 7\theta - \theta^5$ C) $r = 7\theta + \frac{1}{5\theta^5}$ D) $r = 7\theta - \frac{1}{3\theta^3}$

Solve the problem.

237) Given the acceleration, initial velocity, and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 237) ______

$a = 9.8,\ v(0) = -9,\ s(0) = 6$

A) $s = 4.9t^2 - 9t + 6$
B) $s = -4.9t^2 + 9t + 6$
C) $s = 4.9t^2 - 9t$
D) $s = 9.8t^2 - 9t + 6$

Find the extreme values of the function and where they occur.

238) $y = \dfrac{10}{\sqrt{1 - 3x^2}}$ 238) ______

A) The maximum is 10 at x = –2.
B) The minimum is 0 at x = 1.
C) The maximum is 10 at x = 2.
D) The minimum is 10 at x = 0.

Solve the problem.

239) At noon, ship A was 15 nautical miles due north of ship B. Ship A was sailing south at 15 knots (nautical miles per hour; a nautical mile is 2000 yards) and continued to do so all day. Ship B was sailing east at 6 knots and continued to do so all day. The visibility was 5 nautical miles. Did the ships ever sight each other? 239) ______

A) Yes. They were within 3 nautical miles of each other.
B) No. The closest they ever got to each other was 6.6 nautical miles.
C) Yes. They were within 4 nautical miles of each other.
D) No. The closest they ever got to each other was 5.6 nautical miles.

Use differentiation to determine whether the integral formula is correct.

240) $\int 36(9x + 3)^3\,dx = (9x + 3)^4 + C$ 240) ______

A) Yes
B) No

Find the absolute extreme values of each function on the interval.

241) $y = 6 - 5x^2$ on $[-3, 4]$ 241) ______

A) Maximum = (0, 5); minimum = (4, –86)
B) Maximum = (0, 12); minimum = (4, –39)
C) Maximum = (0, 6); minimum = (4, –74)
D) Maximum = (0, 30); minimum = (–3, –39)

Solve the problem.

242) Find the optimum number of batches (to the nearest whole number) of an item that should be produced annually (in order to minimize cost) if 280,000 units are to be made, it costs \$3 to store a unit for one year, and it costs \$360 to set up the factory to produce each batch. 242) ______

A) 36 batches
B) 26 batches
C) 24 batches
D) 34 batches

Solve the initial value problem.

243) $\dfrac{dy}{dx} = 4x^{-3/4},\ y(1) = 5$ 243) ______

A) $y = 4x^{1/4} + 1$
B) $y = 16x^{1/4} + 80$
C) $y = 16x^{1/4} - 11$
D) $y = -\dfrac{3}{4}x^{-7/4} - \dfrac{11}{4}$

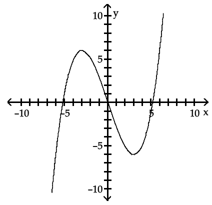
Find the extreme values of the function and where they occur.

244) $y = x^2 + 2x - 3$ 244) ______

A) The minimum is 1 at x = 4.
B) The minimum is 1 at x = –4.
C) The minimum is –1 at x = 4.
D) The minimum is –4 at x = –1.

Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down.

245) 245)



A) Local maximum at $x = 3$; local minimum at $x = -3$; concave up on $(0, -3)$ and $(3, \infty)$; concave down on $(-3, 3)$
B) Local minimum at $x = 3$; local maximum at $x = -3$; concave down on $(0, \infty)$; concave up on $(-\infty, 0)$
C) Local minimum at $x = 3$; local maximum at $x = -3$; concave up on $(0, -3)$ and $(3, \infty)$; concave down on $(-3, 3)$
D) Local minimum at $x = 3$; local maximum at $x = -3$; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$

L'Hopital's rule does not help with the given limit. Find the limit some other way.

246) $\lim\limits_{x \to 0} \dfrac{\sec x}{\csc x}$ 246) ______

A) 1
B) 0
C) ∞
D) –1

Find the derivative at each critical point and determine the local extreme values.

247) $y = \begin{cases} -x^2 - 3x + 6, & x \le 1 \\ -x^2 + 9x - 6, & x > 1 \end{cases}$ 247) ______

A)

Critical Pt.	derivative	Extremum	Value
$x = \frac{3}{2}$	0	local max	$\frac{33}{4}$
$x = 1$	undefined	local min	4
$x = \frac{9}{2}$	undefined	local max	$\frac{57}{4}$

B)

Critical Pt.	derivative	Extremum	Value
$x = -\frac{3}{2}$	0	local max	$\frac{33}{4}$
$x = 1$	undefined	local min	4
$x = -\frac{9}{2}$	0	local max	$\frac{57}{4}$

C)

Critical Pt.	derivative	Extremum	Value
$x = -\frac{3}{2}$	0	local min	$\frac{33}{4}$
$x = 1$	undefined	local max	2
$x = \frac{9}{2}$	0	local min	$\frac{57}{4}$

D)

Critical Pt.	derivative	Extremum	Value
$x = -\frac{3}{2}$	0	local max	$\frac{33}{4}$
$x = 1$	undefined	local min	2
$x = \frac{9}{2}$	0	local max	$\frac{57}{4}$

Use a computer algebra system (CAS) to solve the given initial value problem.

248) $y' = 10x^2 \sin x,\ y(0) = 1$ 248) ______

A) $y = -10(x^2 - 2)\cos x + 20x \sin x - 19$
B) $y = -10x \sin x \cos x + 10 \sin^2 x + 10x^2 + 1$
C) $y = -10x \cos x + 10 \sin x + 1$
D) $y = -10 \cos x^2 + 11$

Identify the function's extreme values in the given domain, and say where they are assumed. Tell which of the extreme values, if any, are absolute.

249) $f(x) = x^2 - 6x,\ -\infty < x \le 6$ 249) ______

A) Local and absolute minimum: (3, –9); Local and absolute maximum: (6, 0)
B) Local minimum: (3, –9); Local and absolute maximum: (6, 0)
C) Local minimum: (6, 0); Local and absolute maximum: (3, –9)
D) Local and absolute minimum: (3, –9); Local maximum: (6, 0)

Use l'Hopital's Rule to evaluate the limit.

250) $f(x) = \dfrac{\sin(5x)}{\sin x};\ \lim\limits_{x \to 0} f(x)$ 250) ______

A) 1
B) –5
C) 0
D) 5

Find the derivative at each critical point and determine the local extreme values.

251) $y = x(1 - x^2)$ 251) ______

A)

Critical Pt.	derivative	Extremum	Value
x = –0.58	0	local max	–0.77
x = 0.58	0	local min	0.38

B)

Critical Pt.	derivative	Extremum	Value
x = 0.58	0	local max	–0.77
x = –0.58	0	local min	0.38

C)

Critical Pt.	derivative	Extremum	Value
x = –0.58	0	local max	0.38
x = 0.58	0	local min	–0.77

D)

Critical Pt.	derivative	Extremum	Value
x = 0.58	0	local max	0.38
x = –0.58	0	local min	–0.38

Give an appropriate answer.

252) Find the value or values of c that satisfy $\dfrac{f(b) - f(a)}{b - a} = f'(c)$ for the function $f(x) = x^2 + 3x + 3$ on the interval $[-3, -2]$. 252) ______

A) $-\dfrac{5}{2}$
B) $-\dfrac{5}{2}, \dfrac{5}{2}$
C) –3, –2
D) $0, -\dfrac{5}{2}$

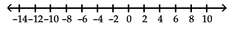
L'Hopital's rule does not help with the given limit. Find the limit some other way.

253) $\lim\limits_{x \to \infty} \dfrac{\sqrt{4x + 1}}{\sqrt{x + 9}}$ 253) ______

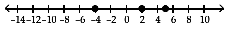
A) 0
B) 4
C) ∞
D) 2

Plot the zeros of the given polynomial on the number line together with the zeros of the first derivative.

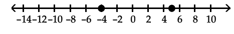
254) $y = (x - 5)(x + 4)^2$ 254)



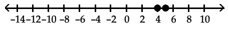
A)



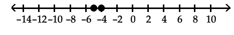
B)



C)



D)



Solve the initial value problem.

255) $\dfrac{d^2r}{dt^2} = \dfrac{4}{t^3};\ \left.\dfrac{dr}{dt}\right|_{t=1} = 4,\ \ r(1) = 5$ 255) ______

A) $r = \dfrac{2}{t} + 6t + 13$
B) $r = 2t + 6t + 13$
C) $r = \dfrac{2}{t} + 6t - 3$
D) $r = \dfrac{4}{-5t^5} + \dfrac{24}{5}t - 3$

Solve the problem.

256) A rectangular field is to be enclosed on four sides with a fence. Fencing costs $5 per foot for two opposite sides, and $7 per foot for the other two sides. Find the dimensions of the field of area 880 ft^2 that would be the cheapest to enclose. 256) ______

A) 35.1 ft @ $5 by 25.1 ft @ $7
B) 41.5 ft @ $5 by 21.2 ft @ $7
C) 25.1 ft @ $5 by 35.1 ft @ $7
D) 21.2 ft @ $5 by 41.5 ft @ $7

Use Newton's method to estimate the requested solution of the equation. Start with given value of x_0 and then give x_2 as the estimated solution.

257) $x^4 - 6x + 3 = 0$; $x_0 = 2$; Find the right-hand solution. 257) ______

A) 1.604 B) 1.600 C) 1.607 D) 1.602

Use l'Hopital's Rule to evaluate the limit.

258) $\lim\limits_{x \to 0} \dfrac{\cos 3x - 1}{x^2}$ 258) ______

A) 0 B) $\dfrac{3}{2}$ C) $\dfrac{9}{2}$ D) $-\dfrac{9}{2}$

Solve the problem.

259) How close does the curve $y = \sqrt{x}$ come to the point $\left(\dfrac{8}{3}, 0\right)$? (Hint: If you minimize the square of the distance, you can avoid square roots.) 259) ______

A) The distance is minimized when $x = \dfrac{13}{3}$; the minimum distance is $\dfrac{8}{3}$ units.

B) The distance is minimized when $x = -\dfrac{1}{4}$; the minimum distance is $\sqrt{\dfrac{29}{12}}$ units.

C) The distance is minimized when $x = \dfrac{5}{3}$; the minimum distance is $\dfrac{8}{3}$ units.

D) The distance is minimized when $x = \dfrac{13}{6}$; the minimum distance is $\sqrt{\dfrac{29}{12}}$ units.

Find the absolute extreme values of each function on the interval.

260) $y = -x^2 + 7x - 12$ on $[4, 3]$ 260) ______

A) Maximum value is $\dfrac{1}{4}$ at $x = \dfrac{7}{2}$; minimum value is 0 at 3 and 0 at $x = 4$

B) Maximum value is $\dfrac{97}{4}$ at $x = \dfrac{7}{2}$; minimum value is 0 at 3 and 0 at $x = 4$

C) Maximum value is $\dfrac{1}{4}$ at $x = \dfrac{9}{2}$; minimum value is 0 at 3 and 0 at $x = 4$

D) Maximum value is $\dfrac{5}{4}$ at $x = \dfrac{9}{2}$; minimum value is 0 at 3 and 0 at $x = 4$

L'Hopital's rule does not help with the given limit. Find the limit some other way.

261) $\lim\limits_{x \to 0} \dfrac{x \cot x}{\cos x}$ 261) ______

A) -1 B) 0 C) 1 D) ∞

Answer each question appropriately.

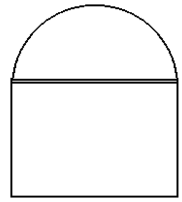
262) Suppose the velocity of a body moving along the s-axis is $\dfrac{ds}{dt} = 9.8t - 4$. 262) ______

Find the body's displacement over the time interval from $t = 3$ to $t = 7$ given that $s = 8$ when $t = 0$.

A) 180 B) 4 C) 39.2 D) 212

Solve the problem.

263) A window is in the form of a rectangle surmounted by a semicircle. The rectangle is of clear glass, whereas the semicircle is of tinted glass that transmits only one-fourth as much light per unit area as clear glass does. The total perimeter is fixed. Find the proportions of the window that will admit the most light. Neglect the thickness of the frame. 263) ______



A) $\dfrac{\text{width}}{\text{height}} = \dfrac{16}{4 + 3\pi}$ B) $\dfrac{\text{width}}{\text{height}} = \dfrac{16}{8 + \pi}$ C) $\dfrac{\text{width}}{\text{height}} = \dfrac{16}{8 + 3\pi}$ D) $\dfrac{\text{width}}{\text{height}} = \dfrac{4}{8 + 3\pi}$

Using the derivative of f(x) given below, determine the critical points of f(x).

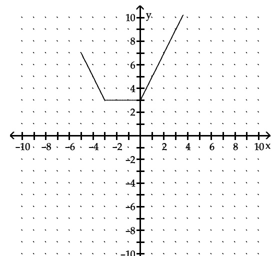
264) $f'(x) = (x - 9)^2(x + 7)$ 264) ______

A) $-9, 0, 7$ B) $-7, 9$ C) $-9, -7, 9$ D) $-9, 7$

Graph the function, then find the extreme values of the function on the interval and indicate where they occur.

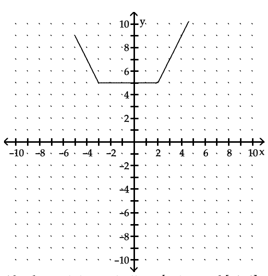
265) $y = |x - 1| + |x + 4|$ on the interval $-5 < x < 5$ 265)

A)



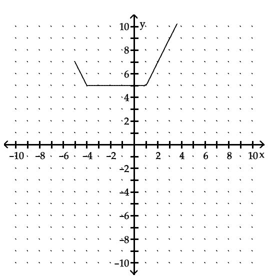
Absolute minimum is: 6 on the interval $[-1, 4]$

B)



Absolute minimum is: 5 on the interval $[-1, 4]$

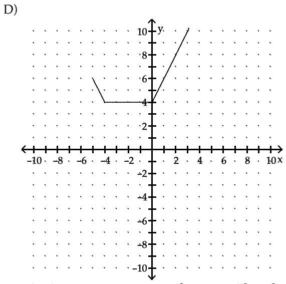
C)



Absolute minimum is: 5 on the interval $[-4, 1]$

D)

D)



Find the most general antiderivative.

266) $\displaystyle\int \left(\frac{\sqrt{y}}{3} + \frac{8}{\sqrt{y}}\right) dy$ 266) ______

A) $\dfrac{2}{9}y^{3/2} + 16\sqrt{y} + C$
B) $\dfrac{1}{6}\sqrt{y} - \dfrac{1}{16\sqrt{y}} + C$
C) $\dfrac{2}{9}y^{3/2} - 16\sqrt{y} + C$
D) $\dfrac{1}{2}y^{3/2} + \dfrac{1}{16}\sqrt{y} + C$

Find the derivative at each critical point and determine the local extreme values.

267) $y = \begin{cases} -\dfrac{1}{4}x^2 - \dfrac{1}{2}x + \dfrac{15}{4}, & x \le 1 \\ x^3 - 6x^2 + 8x, & x > 1 \end{cases}$ 267) ______

A)

Critical Pt.	derivative	Extremum	Value
$x = -1$	0	local max	4
$x = 3.15$	0	local min	-3.08

B)

Critical Pt.	derivative	Extremum	Value
$x = 1$	0	local max	4
$x = 3.15$	undefined	local max	-3.08

C)

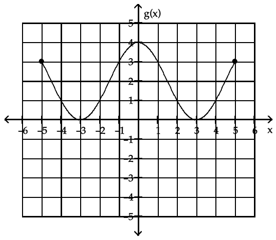
Critical Pt.	derivative	Extremum	Value
$x = -1$	undefined	local min	4
$x = 3.15$	0	local max	-3.08

D)

Critical Pt.	derivative	Extremum	Value
$x = -1$	0	local min	4
$x = 3.15$	0	local max	-3.08

Find the location of the indicated absolute extremum for the function.

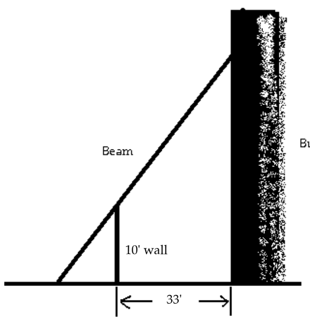
268) Maximum 268)



A) No maximum B) $x = 0$ C) $x = 3$ D) $x = 5$

Solve the problem.

269) The 10 ft wall shown here stands 33 feet from the building. Find the length of the shortest straight beam that will reach to the side of the building from the ground outside the wall. 269) ______

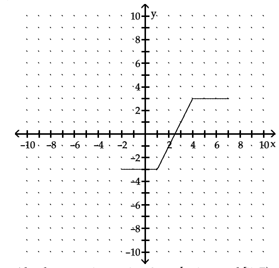


A) 56.7 B) 58.7 C) 57.7 D) 43

Graph the function, then find the extreme values of the function on the interval and indicate where they occur.

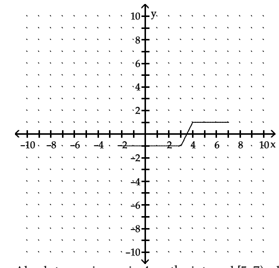
270) $y = |x - 2| - |x - 5|$ on the interval $-2 < x < 7$ 270)

A)



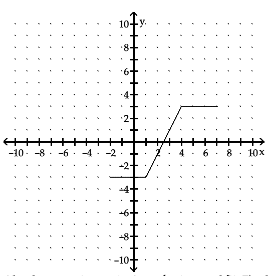
Absolute maximum is: –3 on the interval [5, 7); absolute minimum is: 3 on the interval (–2, 2]

B)



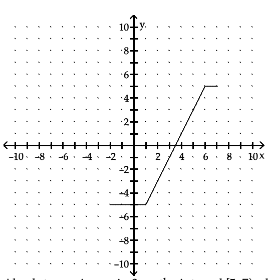
Absolute maximum is: 4 on the interval [5, 7); absolute minimum is: –2 on the interval (–2, 2]

C)



Absolute maximum is: 3 on the interval [5, 7); absolute minimum is: –3 on the interval (–2, 2]

D)



Absolute maximum is: 3 on the interval [5, 7); absolute minimum is: –2 on the interval (–2, 3]

Solve the initial value problem.

271) $\frac{dy}{dx} = \frac{1}{2\sqrt{x}} + 8,\ y(1) = 1$ 271) ______

A) $y = \sqrt{x} + 8x - 8$ B) $y = \frac{1}{\sqrt{x}} + 8x - 8$

C) $y = \frac{-1}{4}\sqrt{x} + 8x - \frac{27}{4}$ D) $y = \sqrt{x} + 8x + 10$

Find the function with the given derivative whose graph passes through the point P.

272) $f'(x) = x^2 + 2$, P(3, 41) 272) ______

A) $f(x) = x^3 + 2x^2 + 26$ B) $f(x) = \frac{x^3}{3} + 2x + 26$

C) $f(x) = x^3 + 2x + 8$ D) $f(x) = \frac{x^3}{3} + 2x$

L'Hopital's rule does not help with the given limit. Find the limit some other way.

273) $\lim\limits_{\theta \to \pi/2^-} \frac{\csc \theta}{\cot \theta}$ 273) ______

A) 0 B) –1 C) 1 D) ∞

Solve the problem.

274) A carpenter is building a rectangular room with a fixed perimeter of 580 ft. What are the dimensions of the largest room that can be built? What is its area? 274) ______

A) 145 ft by 435 ft; 63,075 ft^2 B) 290 ft by 290 ft; 84,100 ft^2

C) 145 ft by 145 ft; 21,025 ft^2 D) 58 ft by 522ft; 30,276 ft^2

Use l'Hopital's Rule to evaluate the limit.

275) $f(x) = \frac{x}{\sin x}$; $\lim\limits_{x \to 0} f(x)$ 275) ______

A) 1 B) $\frac{1}{2}$ C) –1 D) 0

Find the extreme values of the function and where they occur.

276) $y = (x - 1)^{2/3}$ 276) ______

A) The maximum value is 0 at $x = -1$. B) The minimum value is 0 at $x = -1$.

C) There are no definable extrema. D) The minimum value is 0 at $x = 1$.

Answer each question appropriately.

277) How many curves $y = f(x)$ have the following properties? 277) ______

i. $\frac{d^2y}{dx^2} = 10x$

ii. The graph passes through the point (0,3) and has a horizontal tangent at that point.

A) 0 B) Infinitely many C) 1 D) 2

Use l'Hopital's Rule to evaluate the limit.

278) $\lim\limits_{x \to 3} \frac{x^2 - 5x + 6}{x - 3}$ 278) ______

A) 6 B) –2 C) 11 D) 1

Find the largest open interval where the function is changing as requested.

279) Increasing $y = 7x - 5$ 279) ______

A) (–5, 7) B) $(-\infty, 7)$ C) $(-\infty, \infty)$ D) $(-5, \infty)$

Use Newton's method to estimate the requested solution of the equation. Start with given value of x_0 and then give x_2 as the estimated solution.

280) $3x^2 + 2x - 1 = 0$; $x_0 = 1$; Find the right–hand solution. 280) ______

A) 0.50 B) 0.33 C) 0.85 D) 0.35

Find the absolute extreme values of each function on the interval.

281) $f(x) = 2x - 3$; $-2 \le x \le 4$ 281) ______

A) Maximum is 5 at $x = -2$; minimum value is -1 at $x = 4$

B) Maximum is 11 at $x = -4$; minimum value is -7 at $x = 2$

C) Maximum value is 5 at $x = 4$; minimum value is -7 at $x = -2$

D) Maximum is 11 at $x = 4$; minimum value is -1 at $x = -2$

Find the most general antiderivative.

282) $\displaystyle\int \frac{x\sqrt{x} + \sqrt{x}}{x^2}\,dx$ 282) ______

A) $2\sqrt{x} - \dfrac{2}{\sqrt{x}} + C$ B) $-\dfrac{\sqrt{x}}{2} - \dfrac{3\sqrt{x}}{2} + C$

C) C D) $\dfrac{2}{\sqrt{x}} - 2\sqrt{x} + C$

Solve the problem.

283) $f(x) = 3x^2 + 2x - 14$ is continuous on [4, 8] and differentiable on (4, 8). Then, according to the Mean Value Theorem, there is at least one point c in (4, 8) at which __________. 283) ______

A) $f'(c) = 38$ B) $f'(c) = 6$ C) $f(c) = 38$ D) $f(c) = 6$

Use differentiation to determine whether the integral formula is correct.

284) $\displaystyle\int (7x + 6)^{-2}\,dx = -\frac{(7x + 6)^{-1}}{7} + C$ 284) ______

A) Yes B) No

Answer each question appropriately.

285) Find the standard equation for the position s of a body moving with a constant acceleration a along a coordinate line. The following properties are known: 285) ______

i. $\dfrac{d^2s}{dt^2} = a$,

ii. $\dfrac{ds}{dt} = v_0$ when $t = 0$, and

iii. $s = s_0$ when $t = 0$,

where t is time, s_0 is the initial position, and v_0 is the initial velocity.

A) $s = \dfrac{at^2}{2} - v_0t - s_0$ B) $s = at^2 + v_0t + s_0$

C) $s = \dfrac{at^2}{2} + s_0$ D) $s = \dfrac{at^2}{2} + v_0t + s_0$

Solve the problem.

286) Find the number of units that must be produced and sold in order to yield the maximum profit, given the following equations for revenue and cost: 286) ______

$R(x) = 4x$

$C(x) = 0.001x^2 + 1.2x + 10.$

A) 2800 units B) 5200 units C) 2600 units D) 1400 units

Find a value of a so that f is continuous at c, or indicate this is impossible.

287) $f(x) = \begin{cases} x^2 + 5, & x < 0 \\ a, & x = 0; \ c = 0 \\ -4(x - 1) + 1, & x > 0 \end{cases}$ 287) ______

A) 5 B) Impossible C) −4 D) −5

Find the largest open interval where the function is changing as requested.

288) Decreasing $y = \dfrac{1}{x^2} + 7$ 288) ______

A) $(7, \infty)$ B) $(-7, 7)$ C) $(-7, 0)$ D) $(0, \infty)$

Solve the problem.

289) A long strip of sheet metal 12 inches wide is to be made into a small trough by turning up two sides at right angles to the base. If the trough is to have maximum capacity, how many inches should be turned up on each side? 289) ______

A) 3 inches B) 6 inches

C) 4 inches D) 4 inches on one side, 5 inches on the other

Find the extreme values of the function and where they occur.

290) $y = x^3 - 12x + 2$ 290) ______

A) Local maximum at (2, −14), local minimum at (−2, 18).

B) Local maximum at (0, 0).

C) Local maximum at (−2, 18), local minimum at (2, −14).

D) None

Use l'Hopital's Rule to evaluate the limit.

291) $\displaystyle\lim_{x\to\infty} \frac{8x^2 - 5x + 3}{12x^2 + 3x + 11}$ 291) ______

A) $\dfrac{3}{2}$ B) 1 C) $\dfrac{2}{3}$ D) $-\dfrac{2}{3}$

Use l'Hôpital's rule to find the limit.

292) $\displaystyle\lim_{x\to\infty} \frac{4x + 7}{7x^2 + 8x - 8}$ 292) ______

A) 1 B) $\dfrac{4}{7}$ C) 0 D) $\dfrac{2}{7}$

Solve the problem.

293) Given the velocity and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 293) ______

$v = -19t + 7$, $s(0) = 8$

A) $s = -\dfrac{19}{2}t^2 + 7t - 8$ B) $s = -19t^2 + 7t + 8$

C) $s = -\dfrac{19}{2}t^2 + 7t + 8$ D) $s = \dfrac{19}{2}t^2 + 7t - 8$

Find the extreme values of the function and where they occur.

294) $y = x^3 - 3x^2 + 5x - 6$ 294) ______

A) The minimum is 2 at $x = -1$. B) The maximum is 2 at $x = 1$.

C) The maximum is 2 at $x = 2$. D) None

Find the most general antiderivative.

295) $\displaystyle\int (6x^3 + 7x + 3)\,dx$ 295) ______

A) $6x^4 + 7x^2 + 3x + C$ B) $18x^4 + 14x^2 + 3x + C$

C) $\dfrac{3}{2}x^4 + \dfrac{7}{2}x^2 + 3x + C$ D) $18x^2 + 7 + C$

Find the derivative at each critical point and determine the local extreme values.

296) $y = \begin{cases} 8 - x, & x < 0 \\ 8 + 7x - x^2, & x \ge 0 \end{cases}$ 296) ______

A)

Critical Pt.	derivative	Extremum	Value
$x = 0$	undefined	local min	8
$x = \frac{9}{2}$	0	local max	$\frac{113}{4}$

B)

Critical Pt.	derivative	Extremum	Value
$x = 8$	undefined	local min	8
$x = 0$	0	local max	$\frac{81}{4}$

C)

Critical Pt.	derivative	Extremum	Value
$x = 0$	undefined	local min	8
$x = \frac{7}{2}$	0	local max	$\frac{81}{4}$

D)

Critical Pt.	derivative	Extremum	Value
$x = 0$	undefined	local min	−8
$x = \frac{7}{2}$	0	local max	$-\frac{17}{4}$

Find a value of a so that f is continuous at c, or indicate this is impossible.

297) $f(x) = \begin{cases} \dfrac{x + 4}{-5\,|x + 4|}, & x \ne -4 \\ a, & x = -4; \ c = -4 \end{cases}$ 297) ______

A) Impossible B) 4 C) −4 D) −5

Solve the problem.

298) Suppose that $c(x) = 4x^3 - 30x^2 + 9875x$ is the cost of manufacturing x items. Find a production level that will minimize the average cost of making x items. 298) ______

A) 94 items

B) There is not a production level that will minimize average cost.

C) −79 items

D) 9875 items

299) At about what velocity do you enter the water if you jump from a 15 meter cliff? (Use $g = 9.8\ m/sec^2$.) 299) ______

A) −8.5 m/sec B) 17 m/sec C) −17 m/sec D) 2 m/sec

Find the largest open interval where the function is changing as requested.

300) Decreasing $f(x) = -\sqrt{x + 3}$ 300) ______

A) $(-3, \infty)$ B) $(-\infty, -3)$ C) $(3, \infty)$ D) $(-\infty, 3)$

Use differentiation to determine whether the integral formula is correct.

301) $\displaystyle\int x \sin x\,dx = -x \cos x + \sin x + C$ 301) ______

A) Yes B) No

Find the absolute extreme values of each function on the interval.

302) $F(x) = \sqrt[3]{x}$; $-3 \le x \le 8$ 302) ______

A) Maximum = (−8, 2), and Minimum = (0, 0)

B) Maximum = (8, 2), and Minimum = (−8, −2)

C) Maximum = (0 , 0), and Minimum = (8, 2)

D) Maximum = (8, 2), and Minimum = (0, 0)

Solve the problem.

303) At about what velocity do you enter the water is you jump from a 15 meter cliff? (Use $g = 9.8\ m/sec^2$.) 303) ______

A) 17 m/sec B) 2 m/sec C) −17 m/sec D) −8.5 m/sec

Use l'Hôpital's rule to find the limit.

304) $\displaystyle\lim_{x\to 0} \frac{\sin 6x}{\tan 8x}$ 304) ______

A) $\dfrac{3}{4}$ B) $\dfrac{4}{3}$ C) 0 D) $-\dfrac{3}{4}$

Solve the problem.

305) A company is constructing an open-top, square-based, rectangular metal tank that will have a volume of 41 ft^3. What dimensions yield the minimum surface area? Round to the nearest tenth, if necessary. 305) ______

A) 4.3 ft by 4.3 ft. by 2.2 ft B) 5 ft by 5 ft. by 1.7 ft
C) 9.1 ft by 9.1 ft. by 0.5 ft D) 3.4 ft by 3.4 ft. by 3.4 ft

Find the curve y = f(x) in the xy-plane that has the given properties.

306) $\frac{d^2y}{dx^2} = 24x$ and the graph of y passes through the point (0, 1) and has a horizontal tangent there. 306) ______

A) $y = 12x^3 + 1$ B) $y = 12x^2 + 1$ C) $y = 4x^3 - 1$ D) $y = 4x^3 + 1$

Solve the problem.

307) Given the velocity and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 307) ______

$v = -5t + 3,\ s(0) = 15$

A) $s = -\frac{5}{2}t^2 + 3t + 15$ B) $s = -5t^2 + 3t + 15$
C) $s = \frac{5}{2}t^2 + 3t - 15$ D) $s = -\frac{5}{2}t^2 + 3t - 15$

Find an antiderivative of the given function.

308) $x^{-3} + \frac{1}{6\sqrt{x}}$ 308) ______

A) $-\frac{1}{3x^3} + \frac{1}{3}x^{1/2}$ B) $-\frac{1}{2x^3} + \frac{1}{3}x^{1/2}$ C) $-\frac{1}{2x^2} + \frac{1}{3}x^{1/2}$ D) $-\frac{1}{3x^2} + \frac{1}{3}x^{1/2}$

Use differentiation to determine whether the integral formula is correct.

309) $\int \sec(2x - 1)\tan(2x - 1)\,dx = \frac{\sec(2x - 1)}{2} + C$ 309) ______

A) No B) Yes

Find the most general antiderivative.

310) $\int \left(\frac{1}{x^5} - x^5 - \frac{1}{10}\right)dx$ 310) ______

A) $-5x^4 - 5x^5 + C$ B) $\frac{-1}{4x^4} - \frac{x^6}{6} - \frac{x}{10} + C$
C) $\frac{1}{5x^6} - \frac{x^6}{6} - \frac{1}{10x} + C$ D) $\frac{1}{6x^6} - \frac{x^4}{4} + \frac{1}{100} + C$

Solve the problem.

311) A rocket lifts off the surface of Earth with a constant acceleration of 30 m/sec^2. How fast will the rocket be going 2.5 minutes later? 311) ______

A) -4500 m/sec B) 2250 m/sec C) 4500 m/sec D) 3375 m/sec

312) The positions of two particles on the s-axis are $s_1 = \sin t$ and $s_2 = \sin\left(t + \frac{\pi}{4}\right)$, with s_1 and s_2 in meters and t in seconds. 312) ______

At what time(s) in the interval $0 \le t \le 2\pi$ do the particles meet?

A) $t = \frac{1}{2}\pi$ and $t = \frac{3}{2}\pi$ B) $t = \frac{3}{8}\pi$ and $t = \frac{11}{8}\pi$
C) $t = \frac{3}{4}\pi$ and $t = \frac{11}{4}\pi$ D) $t = \pi$ and $t = 2\pi$

Find an antiderivative of the given function.

313) 3 cos 5x 313) ______

A) $\frac{3}{5}\sin 5x$ B) $3\sin 5x$ C) $-15\sin 5x$ D) $\sin 5x$

Find the most general antiderivative.

314) $\int (-2\cos t)\,dt$ 314) ______

A) $-\frac{2}{\sin t} + C$ B) $-\frac{\sin t}{2} + C$ C) $-2\sin t + C$ D) $-2\cos t + C$

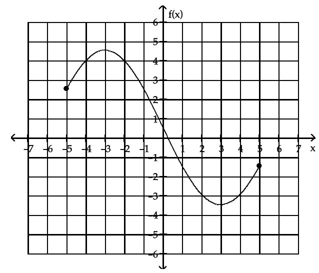
Use the maximum/minimum finder on a graphing calculator to determine the approximate location of all local extrema.

315) $f(x) = 0.1x^3 - 15x^2 + 8x - 10$ 315) ______

A) Approximate local minimum at -99.733; approximate local maximum at -0.267
B) Approximate local maximum at 0.267; approximate local minimum at 99.733
C) Approximate local maximum at -99.733; approximate local minimum at -0.267
D) Approximate local minimum at 0.267; approximate local maximum at 99.733

Find the location of the indicated absolute extremum for the function.

316) Minimum 316)



A) x = 3 B) x = -3 C) x = -5 D) x = 5

Use l'Hôpital's rule to find the limit.

317) $\lim_{\theta \to 0} \frac{\sin \theta^7}{\theta}$ 317) ______

A) 0 B) ∞ C) 1 D) $-\infty$

Find the function with the given derivative whose graph passes through the point P.

318) $r'(t) = \sec^2 t - 4$, P(0, 0) 318) ______

A) r(t) = sec t tan t - 4t - 1 B) r(t) = sec t - 4t - 4
C) r(t) = tan t - 4t D) r(t) = sec t - t - 6

Use l'Hôpital's rule to find the limit.

319) $\lim_{\theta \to 0} \frac{3 - 3\cos\theta}{\sin 4\theta}$ 319) ______

A) ∞ B) $\frac{3}{4}$ C) 0 D) 1

Answer each question appropriately.

320) Suppose the velocity of a body moving along the s-axis is $\frac{ds}{dt} = 9.8t - 3$. 320) ______

Find the body's displacement over the time interval from t = 2 to t = 6 given that $s = s_0$ when t=0.

A) -2.2 B) 132.8
C) 144.8 D) Not enough information is given.

Determine whether the function satisfies the hypotheses of the Mean Value Theorem for the given interval.

321) $s(t) = \sqrt{t(1 - t)}$, $[-1, 5]$ 321) ______

A) No B) Yes

Solve the initial value problem.

322) $\frac{ds}{dt} = \cos t - \sin t$, $s\left(\frac{\pi}{2}\right) = 4$ 322) ______

A) s = sin t + cos t + 3 B) s = 2sin t + 2
C) s = sin t + cos t + 5 D) s = sin t - cos t + 3

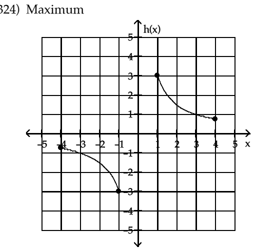
Find the absolute extreme values of each function on the interval.

323) $f(x) = \frac{2}{3}x + 5;\ -3 \le x \le 3$ 323) ______

A) Maximum = $(3, 7)$; and minimum = $(-3, 3)$
B) Maximum= $(-3, -3)$ and minimum = $(3, 3)$
C) Maximum $(-3, -3)$ and minimum = $(3, 3)$
D) Maximum = $(3, -3)$ and minimum = $(-3, 3)$

Find the location of the indicated absolute extremum for the function.

324) Maximum 324)



A) x = 1 B) x = -4 C) No maximum D) x = 4

Find an antiderivative of the given function.

325) $x^6 - \frac{1}{x^6}$ 325) ______

A) $6x^5 + \frac{1}{6x^5}$ B) $\frac{x^7}{7} + \frac{1}{5x^5}$ C) $\frac{x^7}{7} - \frac{1}{7x^7}$ D) $\frac{x^7}{6} - \frac{1}{6x^5}$

Solve the problem.

326) Given the velocity and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 326) ______

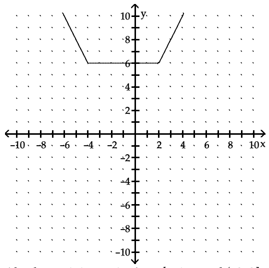
$v = \frac{8}{\pi}\sin\frac{4t}{\pi},\ s(\pi^2) = 2$

A) $s = -2\cos\frac{4t}{\pi} + 8.2134$ B) $s = 2\cos\frac{4t}{\pi} + 4$
C) $s = -2\cos\frac{4t}{\pi} + 3.3073$ D) $s = -2\cos\frac{4t}{\pi} + 4$

Graph the function, then find the extreme values of the function on the interval and indicate where they occur.

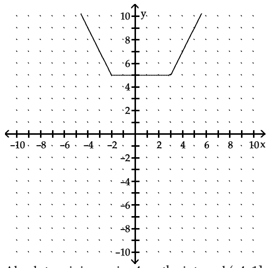
327) $y = |x + 3| + |x - 2|$ on the interval $-\infty < x < \infty$ 327)

A)



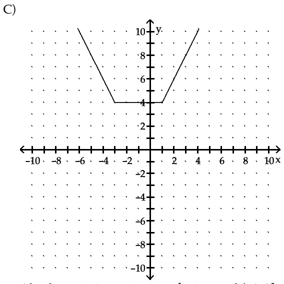
Absolute minimum is: 6 on the interval (−3, 2]

B)



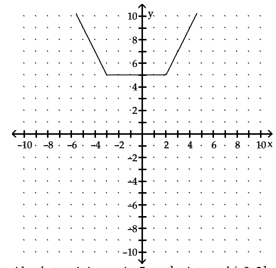
Absolute minimum is: 4 on the interval (−4, 1]

C)



Absolute minimum is: 5 on the interval (−4, 3]

D)



Absolute minimum is: 5 on the interval (−3, 2]

Determine the location of each local extremum of the function.

328) $f(x) = \frac{x^4}{4} - \frac{4}{3}x^3 + \frac{1}{2}x^2 + 6x + 2$ 328) ______

A) Local maximum at −1; local minimum at 3
B) Local maximum at 2; local minima at −1 and 3
C) Local maxima at −1 and 3; local minimum at 2
D) Local maxima at 1 and −3; local minimum at 2

Solve the problem.

329) An object is dropped from 6 ft above the surface of the moon. How long will it take the object to hit the surface of the moon if $d^2s/dt^2 = -5.2$ ft/sec^2? 329) ______

A) 2.31 sec B) 1.07 sec C) 1.52 sec D) 0.58 sec

Use the maximum/minimum finder on a graphing calculator to determine the approximate location of all local extrema.

330) $f(x) = 0.01x^5 - x^4 + x^3 + 8x^2 - 7x + 58$ 330) ______

A) Approximate local maxima at −1.765 and 2.338; approximate local minima at 0.496 and 79.283
B) Approximate local maxima at −1.861 and 2.247; approximate local minimum at 0.423
C) Approximate local maxima at −1.825 and 2.296; approximate local minima at 0.474 and 79.156
D) Approximate local maxima at −1.861 and 2.247; approximate local minima at 0.423 and 79.192

Find the function with the given derivative whose graph passes through the point P.

331) $r'(\theta) = 8 - \csc^2\theta$, $P\left(\frac{\pi}{4}, 0\right)$ 331) ______

A) $r(\theta) = 8\theta - \cot\theta - 2\pi - 2$ B) $r(\theta) = 8\theta + \cot\theta - 2\pi - 1$
C) $r(\theta) = 8\theta - \cot\theta - 2\pi + 2$ D) $r(\theta) = 8\theta + \cot\theta - 2\pi + 1$

Find an antiderivative of the given function.

332) $8\sqrt{x} + 5$ 332) ______

A) $\frac{16}{3}x^{3/2} + 5$ B) $8x^{3/2} + 5x$ C) $8x^{3/2} + 5$ D) $\frac{16}{3}x^{3/2} + 5x$

Find the absolute extreme values of each function on the interval.

333) $f(x) = \sin\left(x + \frac{\pi}{2}\right)$, $0 \le x \le \frac{7\pi}{4}$ 333) ______

A) Maximum value of 1 at $x = \frac{1}{3}\pi$; minimum value of −1 at $x = \frac{2}{3}\pi$,
B) Maximum value of 1 at $x = \frac{4}{3}\pi$; minimum value of −1 at $x = \frac{2}{3}\pi$,
C) Maximum value of 1 at $x = \frac{2}{3}\pi$; minimum value of −1 at $x = \frac{1}{3}\pi$
D) Maximum value of 1 at $x = 0$; minimum value of −1 at $x = \pi$

Find the function with the given derivative whose graph passes through the point P.

334) $g'(x) = \frac{1}{x^2} + 2x$, P(−4, 4) 334) ______

A) $g(x) = -\frac{1}{x} - x^2 - \frac{49}{4}$ B) $g(x) = \frac{1}{x} + x^2 + \frac{49}{4}$
C) $g(x) = \frac{1}{x} + x^2 - \frac{49}{4}$ D) $g(x) = -\frac{1}{x} + x^2 - \frac{49}{4}$

Using the derivative of f(x) given below, determine the intervals on which f(x) is increasing or decreasing.

335) $f'(x) = (3 - x)(4 - x)$ 335) ______

A) Decreasing on (3, 4); increasing on $(-\infty, 3) \cup (4, \infty)$
B) Decreasing on $(-\infty, 3)$; increasing on $(4, \infty)$
C) Decreasing on $(-\infty, -3) \cup (-4, \infty)$; increasing on (−3, −4)
D) Decreasing on $(-\infty, 3) \cup (4, \infty)$; increasing on (3, 4)

Solve the problem.

336) Suppose $c(x) = x^3 - 22x^2 + 20{,}000x$ is the cost of manufacturing x items. Find a production level that will minimize the average cost of making x items. 336) ______

A) 10 items B) 13 items C) 12 items D) 11 items

Find the most general antiderivative.

337) $\int \left(10t^2 + \frac{t}{4}\right)dt$ 337) ______

A) $\frac{10}{3}t^3 + t + C$ B) $20t + \frac{1}{4} + C$ C) $30t^3 + \frac{1}{2}t^2 + C$ D) $\frac{10}{3}t^3 + \frac{t^2}{8} + C$

Find the derivative at each critical point and determine the local extreme values.

338) $y = x^2\sqrt{16 - x}$ 338) ______

A)

Critical Pt.	derivative	Extremum	Value
$x = 16$	undefined	min	0
$x = \frac{64}{5}$	0	local max	$\frac{16384}{125}\sqrt{5}$

B)

Critical Pt.	derivative	Extremum	Value
$x = 0$	0	min	0
$x = 16$	0	min	0
$x = \frac{64}{5}$	0	local max	$\frac{16384}{125}\sqrt{5}$

C)

Critical Pt.	derivative	Extremum	Value
$x = \frac{64}{5}$	0	local max	$\frac{16384}{125}\sqrt{5}$

D)

Critical Pt.	derivative	Extremum	Value
$x = 0$	0	min	0
$x = 16$	undefined	min	0
$x = \frac{64}{5}$	0	local max	$\frac{16384}{125}\sqrt{5}$

Find the function with the given derivative whose graph passes through the point P.

339) $r'(\theta) = \csc\theta\cot\theta - 3$, $P\left(\frac{\pi}{4}, 0\right)$ 339) ______

A) $r(\theta) = -\csc\theta - 3\theta$ B) $r(\theta) = -\csc\theta - \frac{t^9}{3}$

C) $r(\theta) = \csc\theta - 3\theta + \frac{3\pi}{4} + \sqrt{2}$ D) $r(\theta) = -\csc\theta - 3\theta + \frac{3\pi}{4} + \sqrt{2}$

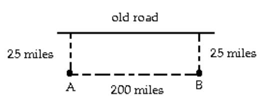
Find the largest open interval where the function is changing as requested.

340) Increasing $f(x) = \frac{1}{4}x^2 - \frac{1}{2}x$ 340) ______

A) $(-\infty, \infty)$ B) $(-1, 1)$ C) $(-\infty, -1)$ D) $(1, \infty)$

Solve the problem.

341) A highway must be constructed to connect town A with town B. There is an existing roadway that can be upgraded 25 miles North of the line connecting the two towns. The cost of upgrading the existing roadway is \$200,000 per mile, whereas the cost of constructing new a new highway is \$300,000 per mile. Find the combination of upgrading and new construction that minimizes the cost of connecting the two towns. Clearly define the location of the new highway. 341) ______



A) Construct new road from town A to the 100 mile mark on the old road. From that point, construct new road directly to town B.

B) Construct 67.08 miles of new road and upgrade 155.28 miles of existing road. From each of the two towns, construct 33.54 miles of new road (on a diagonal) to the old road. Upgrade the middle 155.28 miles of existing road.

C) From town A, construct 25 miles of new road to the old road. Upgrade the old road for 200 miles, then construct 25 miles directly to town B.

D) Construct a new road (200 miles) directly from town A to town B.

Find the extreme values of the function and where they occur.

342) $y = \frac{1}{x^2 + 1}$ 342) ______

A) The maximum value is 1 at x = 0.5, the minimum value is −1 at x = 0.5.

B) The minimum value is −1 at x = 0.5.

C) The maximum value is 1 at x = 0.5.

D) The maximum value is 1 at x = 0.

Solve the problem.

343) On our moon, the acceleration of gravity is 1.6 m/sec^2. If a rock is dropped into a crevasse, how fast will it be going just before it hits bottom 45 seconds later? 343) ______

A) 72 m/sec B) −72 m/sec C) 3240 m/sec D) −36 m/sec

Find an antiderivative of the given function.

344) $-\frac{4}{7}\csc^2\frac{x}{7}$ 344) ______

A) $-4\cot\frac{x}{7}$ B) $-\frac{8}{7}\csc 2\frac{x}{7}\cot\frac{x}{7}$

C) $-\frac{4}{49}\cot\frac{x}{7}$ D) $4\cot\frac{x}{7}$

Solve the problem.

345) Suppose a business can sell x gadgets for p = 250 − 0.01x dollars apiece, and it costs the business c(x) = 1000 + 25x dollars to produce the x gadgets. Determine the production level and cost per gadget required to maximize profit. 345) ______

A) 111 gadgets at \$248.89 each B) 11,250 gadgets at \$137.50 each

C) 10,000 gadgets at \$150.00 each D) 13,750 gadgets at \$112.50 each

Find the curve y = f(x) in the xy-plane that has the given properties.

346) f(x) has a slope at each point given by $-\frac{1}{x^2}$ and passes through the point $\left(\frac{1}{5}, 14\right)$ 346) ______

A) $y = \frac{1}{x} + 9$ B) $y = \frac{3}{x^3} + 9$ C) $y = -\frac{1}{x} + 1$ D) $y = \frac{2}{x} + 9$

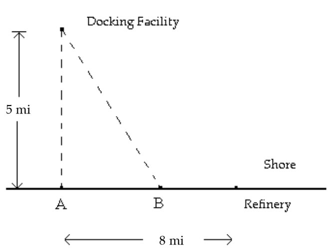
Use differentiation to determine whether the integral formula is correct.

347) $\int \frac{2}{(x+5)^3}\,dx = -\frac{1}{(x+5)^2} + C$ 347) ______

A) No B) Yes

Solve the problem.

348) Supertankers off-load oil at a docking facility shore point 5 mi offshore. The nearest refinery is 8 mi east of the docking facility. A pipeline must be constructed connecting the docking facility with the refinery. The pipeline costs \$300,000 per mile if constructed underwater and \$200,000 per mile if over land. 348) ______



Locate point B to minimize the cost of construction.

A) Point B is 4.47 miles from Point A. B) Point B is 4.41 miles from Point A.

C) Point B is 2.73 miles from Point A. D) Point B is 1.72 miles from Point A.

349) A private shipping company will accept a box for domestic shipment only if the sum of its length and girth (distance around) does not exceed 90 in. Suppose you want to mail a box with square sides so that its dimensions are h by h by w and it's girth is 2h + 2w. What dimensions will give the box its largest volume? 349) ______

A) 30 in. x 15 in. x 30 in. B) 20 in. x 20 in. x 15 in.

C) 15 in. x 15 in. x 75 in. D) 15 in. x 15 in. x 30 in.

Find the largest open interval where the function is changing as requested.

350) Increasing $f(x) = x^2 - 2x + 1$ 350) ______

A) $(0, \infty)$ B) $(-\infty, 1)$ C) $(-\infty, 0)$ D) $(1, \infty)$

Give an appropriate answer.

351) Find the value or values of c that satisfy $\frac{f(b) - f(a)}{b - a} = f'(c)$ for the function $f(x) = x + \frac{27}{x}$ on the interval [3, 9]. 351) ______

A) $-3\sqrt{3}, 3\sqrt{3}$ B) $3\sqrt{3}$ C) $0, 3\sqrt{3}$ D) 3, 9

Answer Key
Testname: 155CH4

1) C
ID: TCALC11W 4.4.3-1
Diff: 0 Page Ref: 268-275
Objective: (4.4) Sketch General Graph of f(x) Given f'(x)

2) D
ID: TCALC11W 4.4.4-1
Diff: 0 Page Ref: 268-275
Objective: (4.4) Graph y Given Graphs of y' and y''

3) A
ID: TCALC11W 4.8.4-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Choose Graph of Initial Value Problem

4) D
ID: TCALC11W 4.1.3-4
Diff: 0 Page Ref: 245-253
Objective: (4.1) Match Graph with Table of Values for f'(x)

5) A
ID: TCALC11W 4.8.4-1
Diff: 0 Page Ref: 308-315
Objective: (4.8) Choose Graph of Initial Value Problem

6) D
ID: TCALC11W 4.4.5-1
Diff: 0 Page Ref: 268-275
Objective: (4.4) Graph y Given Signs of y' and y''

7) D
ID: TCALC11W 4.1.3-1
Diff: 0 Page Ref: 245-253
Objective: (4.1) Match Graph with Table of Values for f'(x)

8) C
ID: TCALC11W 4.4.4-6
Diff: 0 Page Ref: 268-275
Objective: (4.4) Graph y Given Graphs of y' and y''

9) D
ID: TCALC11W 4.4.3-2
Diff: 0 Page Ref: 268-275
Objective: (4.4) Sketch General Graph of f(x) Given f'(x)

10) D
ID: TCALC11W 4.1.1-5
Diff: 0 Page Ref: 245-253
Objective: (4.1) Determine if Graph Exhibits Absolute Extrema

11) C
ID: TCALC11W 4.1.1-1
Diff: 0 Page Ref: 245-253
Objective: (4.1) Determine if Graph Exhibits Absolute Extrema

12) A
ID: TCALC11W 4.4.4-5
Diff: 0 Page Ref: 268-275
Objective: (4.4) Graph y Given Graphs of y' and y''

13) B
ID: TCALC11W 4.4.5-2
Diff: 0 Page Ref: 268-275
Objective: (4.4) Graph y Given Signs of y' and y''

14) C
ID: TCALC11W 4.4.4-4
Diff: 0 Page Ref: 268-275
Objective: (4.4) Graph y Given Graphs of y' and y''

15) D
ID: TCALC11W 4.1.1-2
Diff: 0 Page Ref: 245-253
Objective: (4.1) Determine if Graph Exhibits Absolute Extrema

16) A
ID: TCALC11W 4.1.1-3
Diff: 0 Page Ref: 245-253
Objective: (4.1) Determine if Graph Exhibits Absolute Extrema

17) B
ID: TCALC11W 4.1.3-2
Diff: 0 Page Ref: 245-253
Objective: (4.1) Match Graph with Table of Values for f'(x)

18) C
ID: TCALC11W 4.4.4-3
Diff: 0 Page Ref: 268-275
Objective: (4.4) Graph y Given Graphs of y' and y''

19) C
ID: TCALC11W 4.1.1-4
Diff: 0 Page Ref: 245-253
Objective: (4.1) Determine if Graph Exhibits Absolute Extrema

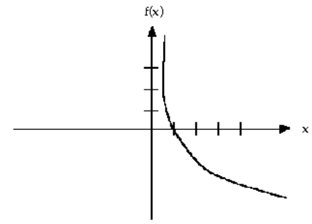
20) D
ID: TCALC11W 4.1.3-3
Diff: 0 Page Ref: 245-253
Objective: (4.1) Match Graph with Table of Values for f'(x)

21) D
ID: TCALC11W 4.4.4-2
Diff: 0 Page Ref: 268-275
Objective: (4.4) Graph y Given Graphs of y' and y''

22) $x_0 = 1$
$x_1 = 0.7837$
$x_2 = 0.7602$
$x_3 = 0.7596$
ID: TCALC11W 4.7.3-4
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Tech: Newton's Method

23) Two such functions are $f(x) = \frac{1}{x}$ and $g(x) = \frac{1}{x^2}$.
ID: TCALC11W 4.6.6-5
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Know Concepts L'Hopital's Rule

24)



Since $f''(x) = \frac{1}{x^2} > 0$ for all $x > 0$, then the function is everywhere concave up.
ID: TCALC11W 4.4.7-6
Diff: 0 Page Ref: 268-275
Objective: (4.4) *Know Concepts: Concavity and Curve Sketching

25) $f(x) = x^4 - 5$, $f'(x) = 4x^3$

$x_1 = -1$

$$x_{n+1} = x_n - \frac{x^4 - 5}{4x^3} = \frac{3x^4 + 5}{4x^3}$$

therefore $x_2 = -2.0000$
ID: TCALC11W 4.7.2-9
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Use Newton's Method II

26) relative minimum
ID: TCALC11W 4.8.11-8
Diff: 0 Page Ref: 308-315
Objective: (4.8) Multi-Part Questions: Applications of Derivatives

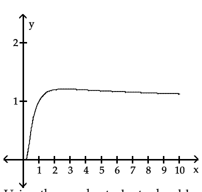
27) $f(x) = 3x^4 - 6x^2 + 2$, $f'(x) = 12x^3 - 12x$

$$x_{n+1} = x_n - \frac{3x_n^4 - 6x_n^2 - 2}{12x_n^3 - 12x_n}$$

1st zero	2nd zero	3rd zero	4th zero
$x_0 = -1.5$	$x_0 = -0.5$	$x_0 = 0.5$	$x_0 = 1.5$
$x_1 = -1.3361$	$x_1 = -0.6528$	$x_1 = 0.6528$	$x_1 = 1.3361$
$x_2 = -1.2686$	$x_2 = -0.6501$	$x_2 = 0.6501$	$x_2 = 1.2686$
$x_3 = -1.2563$	$x_3 = -0.6501$	$x_3 = 0.6501$	$x_3 = 1.2563$

ID: TCALC11W 4.7.3-5
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Tech: Newton's Method

28)



Using the graph, students should estimate the limit to be 1.

Using l'Hopital's rule:
the limit leads to the indeterminate form ∞^0 so let $f(x) = \sqrt{x}^{1/x}$ and take logarithms of both sides

$$\ln f(x) = (1/x) \ln \sqrt{x} = \frac{\ln \sqrt{x}}{x}$$

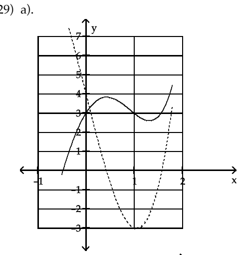
$$\lim_{x \to \infty} \ln f(x) = \lim_{x \to \infty} \frac{\ln \sqrt{x}}{x} \qquad \frac{\infty}{\infty}$$

$$= \lim_{x \to \infty} \frac{(1/\sqrt{x}) \cdot (1/2\sqrt{x})}{1} \qquad \text{differentiate}$$

$$= \lim_{x \to \infty} \frac{1}{2x} = 0$$

So $\lim_{x \to \infty} \sqrt{x}^{1/x} = \lim_{x \to \infty} e^{\ln f(x)} = e^0 = 1$
ID: TCALC11W 4.6.5-6
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Find Limit with L'Hopital's Rule and Graph

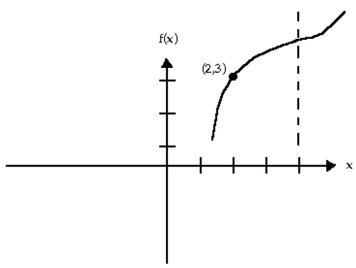
29) a).



Solid line: f(x); dashed line: $f'(x)$
b). See figure above. $f'(x) = 0$ at $x = 0.4323$ and $x = 1.3200$.
Critical points of f(x) are $(0.4323, 3.8297)$ and $(1.3200, 2.6040)$.
c). $f'(x)$ is defined on the entire interval.
d). Endpoints are (-0.5, -0.1875) and (1.8, 4.4976).
e). Absolute minimum: (-0.5, -0.1875); absolute maximum (1.8, 4.4976).
ID: TCALC11W 4.1.10-1
Diff: 0 Page Ref: 245-253
Objective: (4.1) *Tech: Graph and Find Extrema of Function (Multi-Part)

30) Yes. The value of g' at $x = -c$ is also zero since odd functions are symmetric with respect to the origin.
ID: TCALC11W 4.1.8-5
Diff: 0 Page Ref: 245-253
Objective: (4.1) *Know Concepts: Extreme Values

31) Answers will vary. A general shape is indicated below:



ID: TCALC11W 4.4.7–3
Diff: 0 Page Ref: 268–275
Objective: (4.4) *Know Concepts: Concavity and Curve Sketching

32) At the critical point $f' = 0$.This puts x_1 and all later approximations out at $-\infty$ or ∞.
ID: TCALC11W 4.7.5–3
Diff: 0 Page Ref: 300–306
Objective: (4.7) *Know Concepts: Newton's Method

33) False. The function has a non–removable discontinuity at x = 0. The mean value theorem does not apply.
ID: TCALC11W 4.2.9–3
Diff: 0 Page Ref: 256–261
Objective: (4.2) *Know Concepts: Mean Value Theorem

34) Choice (a) is correct. L'Hopital's rule can be applied to $\lim\limits_{x\to -2} \frac{x+2}{x^2-4}$ since it corresponds to the indeterminate form $\frac{0}{0}$.

Choice (b) is incorrect because $(-2)^2 = 4$ not -4.
ID: TCALC11W 4.6.6–3
Diff: 0 Page Ref: 293–298
Objective: (4.6) *Know Concepts L'Hopital's Rule

35) If x , y represent the legs of the triangle, then $x^2 + y^2 = 15^2$.
Solving for y, $y = \sqrt{225 - x^2}$

$A(x) = xy = x\sqrt{225 - x^2}$

$A'(x) = -\frac{x^2}{2\sqrt{225 - x^2}} + \frac{\sqrt{225 - x^2}}{2}$

Solving A'(x) = 0, $x = \pm \frac{15\sqrt{2}}{2}$

Substitute and solve for y: $\left(\frac{15\sqrt{2}}{2}\right)^2 + y^2 = 225$; $y = \frac{15\sqrt{2}}{2}$ $\therefore$ x = y.
ID: TCALC11W 4.5.1–3
Diff: 0 Page Ref: 279–286
Objective: (4.5) Solve Apps: Geometry

36) (a) $f'(x) = \begin{cases} -\frac{2}{\sqrt{-x}} - 2x, & x < 0 \\ \frac{2}{\sqrt{x}} - 2x, & x > 0 \end{cases}$; no.
(b) Local minimum value is 0 at x = 0.
(c) Local maximum value is 3 at x = ±1.
(d) Absolute maximum value is 3;
Absolute minimum value does not exist
because f(x) approaches $-\infty$ as $x \to \pm\infty$
ID: TCALC11W 4.8.11–1
Diff: 0 Page Ref: 308–315
Objective: (4.8) Multi–Part Questions: Applications of Derivatives

37) $f(x) = 2x^4 + 3x - 6 = 0$, $f'(x) = 8x^3 + 3$

Right–hand solution:

$x_1 = 1$

$x_{n+1} = x_n - \frac{2x^4 + 3x - 6}{8x^3 + 3} = \frac{6x^4 + 6}{8x^3 + 3}$

therefore $x_2 = 1.0909$

Left–hand solution:

$x_1 = -1.5$

$x_{n+1} = x_n - \frac{2x^4 + 3x - 6}{8x^3 + 3} = \frac{6x^4 + 6}{8x^3 + 3}$

therefore $x_2 = -1.5156$
ID: TCALC11W 4.7.2–6
Diff: 0 Page Ref: 300–306
Objective: (4.7) *Use Newton's Method II

38) $\lim\limits_{x\to 0} \frac{f'(x)}{g'(x)} = \lim\limits_{x\to 0} \frac{2}{1} = 2$ and $\lim\limits_{x\to 0} \frac{f(x)}{g(x)} = \lim\limits_{x\to 0} \frac{2x+4}{x+1} = 4$. L'Hopital's Rule does not apply to either limit. Neither limit is an indeterminate form.
ID: TCALC11W 4.6.6–8
Diff: 0 Page Ref: 293–298
Objective: (4.6) *Know Concepts L'Hopital's Rule

39) (a) The only critical point in the interval $(0, \infty)$ at x = 12.2. The minimum value of P(x) is 48.9897949 at x = 12.2.
(b) The smallest possible perimeter of the rectangle is 48.9897949 units and it occurs at x = 12.2, which makes the rectangle a 12.2 by 12.2 square.
ID: TCALC11W 4.1.8–3
Diff: 0 Page Ref: 245–253
Objective: (4.1) *Know Concepts: Extreme Values

40) i). $h'(x) = f'(x) + g'(x)$. The signs of the terms are (+) + (–), therefore $h'(x)$ may be positive or negative. Without more information, we cannot determine where h(x) is increasing or decreasing.
ii). $j'(x) = f'(x)g(x) + f(x)g'(x)$. The signs of the terms are (+)(+) + (+)(–) , therefore $j'(x)$ may be positive or negative. Without more information, we cannot determine where j(x) is increasing or decreasing.
iii). $k'(x) = \frac{g'(x)f(x) - g(x)f'(x)}{(f(x))^2}$. The signs of the terms are $\frac{(-)(+) - (+)(+)}{(+)} = (-)$. The quotient $\frac{g(x)}{f(x)}$ is continuous and differentiable for all x, and $k'(x)$ is everywhere negative. So, according to the first derivative test, k(x) is everywhere decreasing.
iv). $p'(x) = (g(x))([f(x)]^{g(x)-1})(g'(x))$. The signs of the factors are (+)(+)(–) = (–). The function $[f(x)]^{g(x)}$ is everywhere continuous and differentiable, and $p'(x)$ is everywhere negative. So, according to the first derivative test, $p'(x)$ is everywhere decreasing.
v). $r'(x) = f'(g(x))g'(x)$. The signs of the factors are (+)(–) = (–). The function $(f \circ g)(x)$ is everywhere continuous and differentiable, and $r'(x)$ is everywhere negative. So, according to the first derivative test, r(x) is everywhere decreasing.
ID: TCALC11W 4.3.7–2
Diff: 0 Page Ref: 263–267
Objective: (4.3) *Know Concepts: First Derivative Test

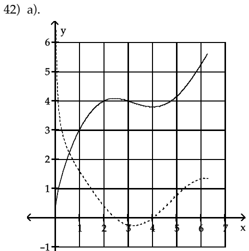
41) $f(x) = 5x^5 - 2x - 4$, $f'(x) = 25x^4 - 2$

$x_1 = 1$

$x_{n+1} = x_n - \frac{5x^5 - 2x - 4}{25x^4 - 2} = \frac{20x^5 + 4}{25x^4 - 2}$

therefore $x_2 = 1.0435$
ID: TCALC11W 4.7.2–5
Diff: 0 Page Ref: 300–306
Objective: (4.7) *Use Newton's Method II

42) a).



Solid line: f(x); dashed line: $f'(x)$
b). See figure above. $f'(x) = 0$ at x = 4.0468 and x = 2.4798.
Critical points of f(x) are (4.0468, 3.7903) and (2.4798, 4.0743).
c). $f'(x)$ is undefined at the endpoint x = 0.
d). Endpoints are (0, 0) and (2π, 5.6050).
e). Absolute minimum: (0, 0); absolute maximum (2π, 5.6050).
ID: TCALC11W 4.1.10–2
Diff: 0 Page Ref: 245–253
Objective: (4.1) *Tech: Graph and Find Extrema of Function (Multi–Part)

43) We calculate $c'(x) = 3tp_0p^2 - 4tp^3$, and find that the only critical point is $p = \frac{3}{4}p_0$. As $c'(x) < 0$ for $p > \frac{3}{4}p_0$ and $c'(x) > 0$ for $p < \frac{3}{4}p_0$, the absolute maximum of c(x) occurs at $p = \frac{3}{4}p_0$.
ID: TCALC11W 4.5.4–5
Diff: 0 Page Ref: 279–286
Objective: (4.5) *Know Concepts: Extrema/Optimization

44) Find the root of $f(x) = -0.0306t^3 + 0.373t^2 - 2.16t + 15.1 - 3.4$.

$f'(x) = -0.0918t^2 + 0.746t - 2.16$

$x_1 = 7$

$x_2 = 7 - \frac{f(7)}{f'(7)} = 7 - \frac{-0.0306(7)^3 + 0.373(7)^2 - 2.16(7) + 8.1}{-0.0918(7)^2 + 0.746(7) - 2.16} = -5.40$

$x_3 = -5.40 - \frac{f(-5.40)}{f'(-5.40)} = -5.40 - \frac{-0.0306(-5.40)^3 + 0.373(-5.40)^2 - 2.16(-5.40) + 8.1}{-0.0918(-5.40)^2 + 0.746(-5.40) - 2.16} = -4.79$

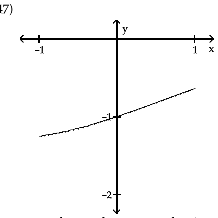
The useful working time is $t = -4.79$ hours.
ID: TCALC11W 4.7.4-2
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Solve Apps: Use Newton's Method

45) The curves cross at $x = 1.39$.
ID: TCALC11W 4.7.3-1
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Tech: Newton's Method

46) The function f(x) is continuous on the open interval $(-\infty, 0)$. Also, f(x) approaches $-\infty$ as x approaches $-\infty$, and f(x) approaches ∞ as x approaches 0 from the left. Since f(x) is continuous and changes sign along the interval, it must have at least one root on the interval.

The first derivative of f(x) is $f'(x) = 3x^2 - \frac{6}{x^3}$, which is everywhere positive on $(-\infty, 0)$. Thus, f(x) has a single root on $(-\infty, 0)$.
ID: TCALC11W 4.2.4-1
Diff: 0 Page Ref: 256-261
Objective: (4.2) *Show That Function Exhibits a Single Root on Interval

47)



Using the graph, students should estimate the limit to be -1.

Using l'Hopital's rule:

$$\lim_{x\to 0} \frac{\cos x - 1}{e^x - x - 1} = \lim_{x\to 0} \frac{-\sin x}{e^x - 1}$$
$$= \lim_{x\to 0} \frac{-\cos x}{e^x} = \frac{-1}{1} = -1$$

ID: TCALC11W 4.6.5-3
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Find Limit with L'Hopital's Rule and Graph

48) $f(x) = 3x^2 + 4x - 5$, $f'(x) = 6x + 4$

Right-hand solution:

$x_1 = 0.5$

$x_{n+1} = x_n - \frac{3x^2 + 4x - 5}{6x + 4} = \frac{3x^2 + 5}{6x + 4}$

therefore $x_2 = 0.8214$

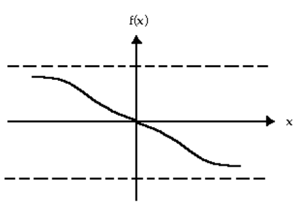
Left-hand solution:

$x_1 = -2$

$x_{n+1} = x_n - \frac{3x^2 + 4x - 5}{6x + 4} = \frac{3x^2 + 5}{6x + 4}$

therefore $x_2 = -2.1250$
ID: TCALC11W 4.7.2-1
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Use Newton's Method II

49) Answers will vary. A general shape is indicated below:



ID: TCALC11W 4.4.7-2
Diff: 0 Page Ref: 268-275
Objective: (4.4) *Know Concepts: Concavity and Curve Sketching

50) The derivative of the function is $f'(x) = 1 - \frac{1}{x^2}$, which is positive for all $x > 1$. By the first derivative test, the function is increasing at $c = 6$.
ID: TCALC11W 4.3.7-1
Diff: 0 Page Ref: 263-267
Objective: (4.3) *Know Concepts: First Derivative Test

51) (a). Moving towards to origin on (1, 2) and (5.7, 7); moving away from the origin on (0, 1), (2, 5.7), and (7, 10).
(b). Velocity is zero at the extrema. These occur at $t \approx 1$ sec and $t \approx 5.7$ sec.
(c). Acceleration is zero at the inflection points. These occur at $t \approx 2.3$ sec, $t \approx 4$ sec, $t \approx 5.1$ sec, $t \approx 7$ sec, and $t \approx 8.5$ sec.
(d). Acceleration is positive where f(t) is concave up and negative where it is concave down. Acceleration is positive on (2.3, 4), (5.1, 7), and (8.5, 10). Acceleration is negative on (0, 2.3), (4, 5.1), and (7, 8.5).
ID: TCALC11W 4.4.7-8
Diff: 0 Page Ref: 268-275
Objective: (4.4) *Know Concepts: Concavity and Curve Sketching

52) $f(x) = 2\sin x - 4x + 5$

$f'(x) = 2\cos x - 4$

$x_1 = 1.5$

$x_{n+1} = \frac{2x\cos x - 2\sin x - 5}{2\cos x - 4}$

therefore x_2 must be 1.75783963
ID: TCALC11W 4.7.2-7
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Use Newton's Method II

53) L'Hopital's Rule cannot be applied to $\lim_{x\to -2} \frac{3x^2 - 4x}{6x - 6}$ because it corresponds to $\frac{20}{-18}$ which is not an indeterminate form.
ID: TCALC11W 4.6.6-10
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Know Concepts L'Hopital's Rule

54) $f(x) = x^4 - 3x^3 - 3x^2 - 3x + 4$, $f'(x) = 4x^3 - 9x^2 - 6x - 3$

$$x_{n+1} = x_n - \frac{x_n^4 - 3x_n^3 - 3x_n^2 - 3x_n + 4}{4x_n^3 - 9x_n^2 - 6x_n - 3}$$

Left-hand solution	Right-hand solution
$x_0 = 1$	$x_0 = 3.5$
$x_1 = 0.7143$	$x_1 = 4.0856$
$x_2 = 0.6657$	$x_2 = 3.9204$
$x_3 = 0.6641$	$x_3 = 3.8995$

ID: TCALC11W 4.7.3-2
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Tech: Newton's Method

55) (i) The roots of the function $y = 3x^3 - 3x - 1$ can be calculated by using Newton's method. Resulting in three roots: -0.743275, -0.39485248, and 1.13725448.

(ii) The x-coordinate of the intersection of $y = x^3$ and $y = 3x + 1$ is the root of $y = 3x^3 - 3x - 1$: -0.743275.

(iii) The curve $y = x^3 - 3x$ crosses the horizontal line $y = 1$ at the solution of $y = 3x^3 - 3x - 1$ which is the same as the functions in part (i) and (ii).

(iv) The values of x where the derivative of g(x) equals zero are the same as the functions in part (i) and (ii)
ID: TCALC11W 4.7.5-1
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Know Concepts: Newton's Method

56) Yes, the Mean Value Theorem implies that the runner attained a speed of 12.5 mph, which was her average speed throughout the marathon.
ID: TCALC11W 4.2.8-3
Diff: 0 Page Ref: 256-261
Objective: (4.2) *Solve Apps: The Mean Value Theorem

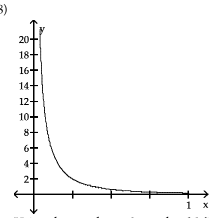
57) $f(x) = \sqrt[a]{x}$; $f'(x) = \frac{1}{a}x^{\frac{1}{a} - 1}$

$$x_{n+1} = x_n - \frac{\sqrt[a]{x_n}}{\frac{1}{a}x_n^{\frac{1}{a} - 1}} = (1-a)x_n$$

$x_0 = 1$
$x_1 = 1 - a$
$x_2 = (1 - a)^2$
$x_3 = (1 - a)^3$

$|x_{n+1}| = |(1 - a)^{n+1}|$

as $n \to \infty$, $|x_n| \to \infty$
ID: TCALC11W 4.7.5-4
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Know Concepts: Newton's Method

58)


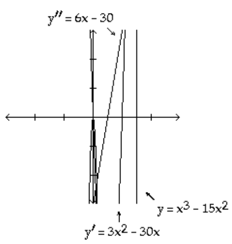
Using the graph, students should find the limit to be ∞.

Using l'Hopital's rule:
the limit leads to the indeterminate form $\infty - \infty$ so combine the fractions and apply l'Hopital's rule:

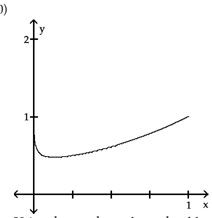
$$\lim_{x \to 0} \frac{1}{\sin x} - \frac{1}{\sqrt{x}} = \lim_{x \to 0} \frac{\sqrt{x} - \sin x}{\sqrt{x}\ \sin x}$$
$$= \lim_{x \to 0} \frac{(1/2\sqrt{x}) - \cos x}{(1/2\sqrt{x})\sin x + \sqrt{x}\cos x}$$
$$= \lim_{x \to 0} \frac{1 - 2\sqrt{x}\cos x}{\sin x + 2x\cos x}$$
$$= \frac{1}{0} = \infty$$

ID: TCALC11W 4.6.5-7
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Find Limit with L'Hopital's Rule and Graph

59) The zeros of $y' = 0$ and $y'' = 0$ are extrema and points of inflection, respectively. Inflection at $x = 5$, local maximum at $x = 0$, local minimum at $x = 10$.



ID: TCALC11W 4.4.6-2
Diff: 0 Page Ref: 268-275
Objective: (4.4) *Analyze and Sketch Curve

60)


Using the graph, students should estimate the limit to be 1.

Using l'Hopital's rule:
the limit leads to the indeterminate form 0^0 so let $f(x) = x^{\sqrt{x}}$ and take logarithms of both sides

$\ln f(x) = \sqrt{x}\ln x = \frac{\ln x}{1/\sqrt{x}}$

$$\lim_{x \to 0^+} \ln f(x) = \lim_{x \to 0^+} \frac{\ln x}{1/\sqrt{x}} \qquad \frac{-\infty}{\infty}$$
$$= \lim_{x \to 0^+} \frac{1/x}{-1/2x^{3/2}} \qquad \text{differentiate}$$
$$= \lim_{x \to 0^+} -2\sqrt{x} = 0$$

So $\lim_{x \to 0^+} x^{\sqrt{x}} = \lim_{x \to 0^+} e^{\ln f(x)} = e^0 = 1$
ID: TCALC11W 4.6.5-4
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Find Limit with L'Hopital's Rule and Graph

61) (a) No
(b) No
(c) No
(d) Minimum: 0 at $x = \pm 4$ and $x = 0$; local maximum: 24.6336115 at $x = \pm 2.30940108$
ID: TCALC11W 4.1.8-2
Diff: 0 Page Ref: 245-253
Objective: (4.1) *Know Concepts: Extreme Values

62) $f(x) = 4x - 2x^2 + 3$, $f'(x) = 4 - 4x$

Right–hand solution:

$x_1 = 1.5$

$x_{n+1} = x_n - \frac{4x - 2x^2 + 3}{4 - 4x} = \frac{-2x^2 - 3}{4 - 4x}$

therefore $x_2 = 3.7500$

Left–hand solution:

$x_1 = -1$

$x_{n+1} = x_n - \frac{4x - 4x^2 + 3}{4 - 4x} = \frac{-2x^2 - 3}{4 - 4x}$

therefore $x_2 = -0.6250$

ID: TCALC11W 4.7.2–10
Diff: 0 Page Ref: 300–306
Objective: (4.7) *Use Newton's Method II

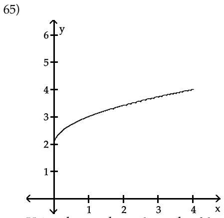
63) $r_1 = 2.0783$
$r_2 = 0.0809$
$r_3 = 0.9191$
$r_4 = -1.0783$

ID: TCALC11W 4.7.3–6
Diff: 0 Page Ref: 300–306
Objective: (4.7) *Tech: Newton's Method

64) Yes. The value of f' at $x = -c$ must also be zero since even functions are symmetrical with respect to the y–axis.

ID: TCALC11W 4.1.8–4
Diff: 0 Page Ref: 245–253
Objective: (4.1) *Know Concepts: Extreme Values

65)



Using the graph, students should estimate the limit to be approximately 3.4.

Using l'Hopital's rule:

$$\lim_{x \to 2} \frac{x\sqrt{x} - 2\sqrt{x} + 2x - 4}{x - 2} = \lim_{x \to 2} \frac{\sqrt{x} + (x/2\sqrt{x}) - (1/\sqrt{x}) + 2}{1}$$

$$= \frac{\sqrt{2} + (2/2\sqrt{2}) - (1/\sqrt{2}) + 2}{1} = \sqrt{2} + 2$$

ID: TCALC11W 4.6.5–1
Diff: 0 Page Ref: 293–298
Objective: (4.6) *Find Limit with L'Hopital's Rule and Graph

66) The function $r(\theta)$ is continuous on the open interval $(0, \pi)$. Also, $r(\theta)$ approaches ∞ as θ approaches 0 from the right, and $r(\theta)$ approaches $-\infty$ as θ approaches π from the left. Since $r(\theta)$ is continuous and changes sign along the interval, it must have at least one root on the interval.

The first derivative of $r(\theta)$ is $r'(\theta) = -4\csc^2\theta - \frac{2}{\theta^3}$, which is everywhere negative on $(0, \pi)$. Thus, $r(\theta)$ has a single root on $(0, \pi)$.

ID: TCALC11W 4.2.4–2
Diff: 0 Page Ref: 256–261
Objective: (4.2) *Show That Function Exhibits a Single Root on Interval

67) The average rate of temperature change is $\frac{135}{26}$° F/sec during the 26 seconds. Therefore, the Mean Value Theorem implies that at sometime during this time period, the temperature was changing at a rate of $\frac{135}{26}$° F/sec.

ID: TCALC11W 4.2.8–1
Diff: 0 Page Ref: 256–261
Objective: (4.2) *Solve Apps: The Mean Value Theorem

68) $f(x) = \begin{cases} \sqrt{x - 8}, & x \ge 8 \\ -\sqrt{8 - x}, & x < 8 \end{cases}$

$f'(x) = \begin{cases} \dfrac{1}{2\sqrt{x - 8}}, & x \ge 8 \\ \dfrac{1}{2\sqrt{8 - x}}, & x < 8 \end{cases}$

Let $x_0 = h$. Then,

$x_1 = h - \dfrac{\sqrt{h - 8}}{\dfrac{1}{2\sqrt{h - 8}}} = h - 2(h - 8) = 16 - h$

$x_2 = 16 - h + \dfrac{\sqrt{8 - (16 - h)}}{\dfrac{1}{2\sqrt{8 - (16 - h)}}} = 16 - h + 2(h - 8) = h$

Likewise, let $x_0 = -h$. Then,

$x_1 = -h + \dfrac{\sqrt{8 + h}}{\dfrac{1}{2\sqrt{8 + h}}} = -h + 2(8 + h) = 16 + h$

$x_2 = 16 + h - \dfrac{\sqrt{(16 + h) - 8}}{\dfrac{1}{2\sqrt{(16 + h) - 8}}} = 16 + h - 2(h + 8) = -h$

ID: TCALC11W 4.7.5–5
Diff: 0 Page Ref: 300–306
Objective: (4.7) *Know Concepts: Newton's Method

69) If he asks for a delivery every x days, then he must order (px) to have enough material for that delivery cycle. The average amount in storage is approximately one–half of the delivery amount, or $\frac{px}{2}$. Thus, the cost of delivery and storage for each cycle is approximately

Cost per cycle = delivery costs + storage costs

Cost per cycle = $d + \frac{px}{2} \cdot x$

We compute the average daily cost c(x) by dividing the cost per cycle by the number of days x in the cycle.

$c(x) = \frac{d}{x} + \frac{px}{2}$

We find the critical points by determining where the derivative is equal to zero.

$c'(x) = -\frac{d}{x^2} + \frac{p}{2} = 0$

$x = \pm\sqrt{\frac{2d}{p}}$

Therefore, an absolute minimum occurs at $\sqrt{\frac{2d}{p}}$ days.

ID: TCALC11W 4.5.5–1
Diff: 0 Page Ref: 279–286
Objective: (4.5) *Solve Apps: Extrema/Optimization

70) $y' = -\csc^2(x) + \frac{2\sqrt{3}}{3}\csc(x)\cot(x) = \csc(x)\left[\frac{2\sqrt{3}}{3}\cot(x) - \csc(x)\right] = 0 \Rightarrow \left[\frac{2\sqrt{3}}{3}\cot(x) - \csc(x)\right] = 0 \Rightarrow 1 - \frac{2\sqrt{3}}{3}\cos(x) = 0 \Rightarrow$
$\cos(x) = \dfrac{1}{\dfrac{2\sqrt{3}}{3}} \Rightarrow x = \frac{2\pi}{3}$

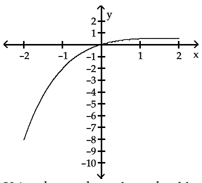
ID: TCALC11W 4.5.4–2
Diff: 0 Page Ref: 279–286
Objective: (4.5) *Know Concepts: Extrema/Optimization

71) Yes. Since cos x = 0 at all points of $\pi + k\pi$, if you choosing your starting value too large or too small, it will converge to a different solution.

ID: TCALC11W 4.7.5–2
Diff: 0 Page Ref: 300–306
Objective: (4.7) *Know Concepts: Newton's Method

72) $\lim_{x \to 3} f(x)^{g(x)} = \lim_{x \to 3} (x - 3)^{2 - 2/(x - 3)^2} = \infty$

ID: TCALC11W 4.6.6–7
Diff: 0 Page Ref: 293–298
Objective: (4.6) *Know Concepts L'Hopital's Rule

73) 

Using the graph, students should estimate the limit to be 0.

Using l'Hopital's rule:

$$\lim_{x \to \infty} \frac{x}{2^x} = \lim_{x \to \infty} \frac{1}{\ln 2 \cdot 2^x} = 0$$

ID: TCALC11W 4.6.5-5
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Find Limit with L'Hopital's Rule and Graph

74) Yes. The derivative is cubic: $4ax^3 + 3bx^2 + 2cx + d$. The derivative approaches $-\infty$ as x approaches $-\infty$ and it approaches ∞ as x approaches ∞. By the Intermediate Value Theorem, $f'(x)$ must equal zero at at least one point on the interval $-\infty \le x \le \infty$.
ID: TCALC11W 4.1.8-7
Diff: 0 Page Ref: 245-253
Objective: (4.1) *Know Concepts: Extreme Values

75) Yes. the function is a flat line $f(x) = C$. One may say that every value of x is a critical point since critical points are by definition points where $f'(x) = 0$. But none of these points correspond to extreme values.
ID: TCALC11W 4.1.8-6
Diff: 0 Page Ref: 245-253
Objective: (4.1) *Know Concepts: Extreme Values

76) This example does not contradict Rolle's Theorem because the function f is not continuous on the closed interval [0, 1]. In particular, f is not continuous at the right end point x = 1.
ID: TCALC11W 4.2.9-1
Diff: 0 Page Ref: 256-261
Objective: (4.2) *Know Concepts: Mean Value Theorem

77) $f(x) = -3x^3 - 2x - 1$, $f'(x) = -9(x^2) - 2$

$x_1 = -0.5$

$$x_{n+1} = x_n - \frac{-3x^3 - 2x - 1}{-9(x^2) - 2} = \frac{-6x^3 + 1}{-9x^2 - 2}$$

therefore $x_2 = -0.4118$
ID: TCALC11W 4.7.2-4
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Use Newton's Method II

78) Choice (a) is incorrect. L'Hopital's rule cannot be applied to $\lim_{x \to 4} \frac{x - 4}{x^2 - 4}$ because it corresponds to $\frac{0}{12}$ which is not an indeterminate form. Choice (b) is correct.
ID: TCALC11W 4.6.6-2
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Know Concepts L'Hopital's Rule

79) L'Hôpital's Rule cannot be applied to $\lim_{x \to \infty} \frac{\sin(1/x)}{e^{1/x}}$ because it corresponds to $\frac{0}{1}$, which is not an indeterminate form.
ID: TCALC11W 4.6.6-1
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Know Concepts L'Hopital's Rule

80) The graph will be a straight line. Since $y'' = 0$, this means there is no change in y', which is the slope of y. A constant slope implies a straight line.
ID: TCALC11W 4.4.7-4
Diff: 0 Page Ref: 268-275
Objective: (4.4) *Know Concepts: Concavity and Curve Sketching

81) (a) $h(x) = \sqrt{144 - 12x}$ in.

(b) $V(x) = \frac{1}{3}x^2\sqrt{144 - 12x}$ in.

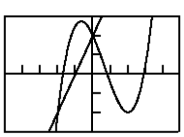
(c) Maximum volume is $30.72\sqrt{28.8} \approx 164.861$ in.^{3} when x = 9.6.
ID: TCALC11W 4.8.11-4
Diff: 0 Page Ref: 308-315
Objective: (4.8) Multi-Part Questions: Applications of Derivatives

82) $x_2 = 1.0000$
ID: TCALC11W 4.7.2-3
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Use Newton's Method II

83) (a) $(-\infty, -\frac{2}{3}]$, $[2, \infty)$

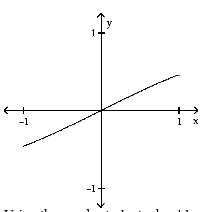
(b) $[-\frac{2}{3}, 2]$

(c)



[-5, 5] by [-3, 3]

(d) $c = \frac{2 - 2\sqrt{7}}{3}$
ID: TCALC11W 4.8.11-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Multi-Part Questions: Applications of Derivatives

84) 

Using the graph, students should estimate the limit to be 0.

Using l'Hopital's rule:

$$\lim_{x \to 0} \frac{1 - \cos x}{x} = \lim_{x \to 0} \frac{\sin x}{1}$$

$$= \frac{\sin 0}{1} = \frac{0}{1} = 0$$

ID: TCALC11W 4.6.5-2
Diff: 0 Page Ref: 293-298
Objective: (4.6) *Find Limit with L'Hopital's Rule and Graph

85) Yes, all antiderivatives of g' are of the form $G(t) = -4t + C$, where is is a constant. The only such function to satisfy the initial condition $g(0) = -5$ is $g(t) = -4t - 5$.
ID: TCALC11W 4.2.9-2
Diff: 0 Page Ref: 256-261
Objective: (4.2) *Know Concepts: Mean Value Theorem

86) (a) $v(t) = -2\pi t \sin(\pi t^2)$
(b) $a(t) = -2\pi \sin(\pi t^2) - 4\pi^2 t^2 \cos(\pi t^2)$
(c) $1 < t < \sqrt{2}$, $\sqrt{3} < t < 2$, $\sqrt{5} < t < \sqrt{6}$, $\sqrt{7} < t < \sqrt{8}$.
(d) $-8\pi^2 \approx -78.957$
ID: TCALC11W 4.8.11-3
Diff: 0 Page Ref: 308-315
Objective: (4.8) Multi-Part Questions: Applications of Derivatives

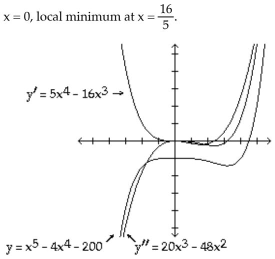
87) $f(x) = x^4 - 2$, $f'(x) = 4x^3$

$x_1 = 1$

$$x_{n+1} = x_n - \frac{x^4 - 2}{4x^3} = \frac{3x^4 + 2}{4x^3}$$

therefore $x_2 = 1.2500$
ID: TCALC11W 4.7.2-8
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Use Newton's Method II

88) The zeros of $y' = 0$ and $y'' = 0$ are extrema and points of inflection, respectively. Inflection at $x = \frac{12}{5}$, local maximum at x = 0, local minimum at $x = \frac{16}{5}$.



ID: TCALC11W 4.4.6-1
Diff: 0 Page Ref: 268-275
Objective: (4.4) *Analyze and Sketch Curve

89) 4 solutions
ID: TCALC11W 4.7.3-3
Diff: 0 Page Ref: 300-306
Objective: (4.7) *Tech: Newton's Method

90) Notice that $g'(x) = \dfrac{b^2}{(b^2 + (a + x)^2)^{3/2}}$ is positive for all values of x. Therefore g is increasing everywhere.

ID: TCALC11W 4.5.4–4
Diff: 0 Page Ref: 279–286
Objective: (4.5) *Know Concepts: Extrema/Optimization

91) L'Hopital's Rule cannot be applied to $\lim\limits_{x \to 0} \dfrac{\cos x}{1 + 2x}$ because it corresponds to $\dfrac{1}{1}$ which is not an indeterminate form.

ID: TCALC11W 4.6.6–9
Diff: 0 Page Ref: 293–298
Objective: (4.6) *Know Concepts L'Hopital's Rule

92) $f(x) = -3x^2 - 2x + 5$, $f'(x) = -6x - 2$

Right–hand solution:

$x_1 = 0.5$

$x_{n+1} = x_n - \dfrac{-3x^2 - 2x + 5}{-6x - 2} = \dfrac{-3x^2 - 5}{-6x - 2}$

therefore $x_2 = 1.1500$

Left–hand solution:

$x_1 = -2$

$x_{n+1} = x_n - \dfrac{-3x^2 - 2x + 5}{-6x - 2} = \dfrac{-3x^2 - 5}{-6x - 2}$

therefore $x_2 = -1.7000$

ID: TCALC11W 4.7.2–2
Diff: 0 Page Ref: 300–306
Objective: (4.7) *Use Newton's Method II

93) (a) No, since $f'(x) = \dfrac{2}{3}(x - 8)^{-1/3}$, which is undefined at $x = 8$.

(b) The derivative is defined and nonzero for all $x \neq 8$.
(c) No, f(x) need not have a global maximum because its domain is all real numbers. Any restriction of f to a closed interval of the form [a, b] would have both a maximum value and a minimum value on the interval.
(d) The answers are the same as (a) and (b) with 8 replaced by c.

ID: TCALC11W 4.1.8–1
Diff: 0 Page Ref: 245–253
Objective: (4.1) *Know Concepts: Extreme Values

94) Find the root of $f(x) = C(x) - R(x) = 299 + 30x^{5/8} - 4x$.

$f'(x) = \dfrac{75}{4}x^{-3/8} - 4$

$x_1 = 370$

$x_2 = 370 - \dfrac{f(370)}{f'(370)} = 370 - \dfrac{299 + 30 \cdot 370^{5/8} - 4(370)}{\frac{75}{4} \cdot 370^{-3/8} - 4} = 384.04$

$x_3 = 384.04 - \dfrac{f(384.04)}{f'(384.04)} = 384.04 - \dfrac{299 + 30 \cdot 384.04^{5/8} - 4(384.04)}{\frac{75}{4} \cdot 384.04^{-3/8} - 4} = 383.94$

The break–even point is $x = 383.94$ tools.

ID: TCALC11W 4.7.4–1
Diff: 0 Page Ref: 300–306
Objective: (4.7) *Solve Apps: Use Newton's Method

95) a: both y' and y'' are undefined.
b: $y' = 0$ and $y'' > 0$
c: $y' > 0$ and $y'' = 0$
d: $y' = 0$ and $y'' = 0$
e: $y' > 0$ and $y'' = 0$
f: $y' = 0$ and $y'' < 0$
g: $y' < 0$ and $y'' = 0$

ID: TCALC11W 4.4.7–7
Diff: 0 Page Ref: 268–275
Objective: (4.4) *Know Concepts: Concavity and Curve Sketching

96) $\lim\limits_{x \to 3} f(x)^{g(x)} = \lim\limits_{x \to 3} (x - 3)^{2/(x-3)^2} = 0$

ID: TCALC11W 4.6.6–6
Diff: 0 Page Ref: 293–298
Objective: (4.6) *Know Concepts L'Hopital's Rule

97) (a) $A = 20 + 20h$; $V = 20h + 10h^2$
(b) $\dfrac{1}{6}$ ft/min
(c) $\dfrac{10}{3}$ ft^2/min

ID: TCALC11W 4.8.11–5
Diff: 0 Page Ref: 308–315
Objective: (4.8) Multi–Part Questions: Applications of Derivatives

98) As the trucker's average speed was 78 mph, the Mean Value Theorem implies that the trucker must have been going that speed at least once during the trip.

ID: TCALC11W 4.2.8–2
Diff: 0 Page Ref: 256–261
Objective: (4.2) *Solve Apps: The Mean Value Theorem

99) The curve can have 0 or 2 inflection points. The second derivative is quadratic, $y'' = 12ax^2 + 6bx + 2c$, and quadratics may have 0, 1, or 2 roots, depending on the value of the discriminant. If $36b^2 - 96ac < 0$, then y'' has no real roots and y has no inflection points. If $36b^2 - 96ac = 0$, then y'' has exactly one real root and y has a single inflection point. Finally, if $36b^2 - 96ac > 0$, then y'' has two real roots and y has exactly two inflection points.

ID: TCALC11W 4.4.7–5
Diff: 0 Page Ref: 268–275
Objective: (4.4) *Know Concepts: Concavity and Curve Sketching

100) Yes. The point $x = c$ is either a local maximum, a local minimum, or an inflection point. But, since $f''(x) > 0$ for all x in the domain, there are no inflection points and the curve is everywhere concave up and thus cannot have a local maximum. Hence, there is a local minimum at $x = c$.

ID: TCALC11W 4.4.7–1
Diff: 0 Page Ref: 268–275
Objective: (4.4) *Know Concepts: Concavity and Curve Sketching

101) Two such functions are $f(x) = 4x^2 + 4$ and $g(x) = x^2 + 1$.

ID: TCALC11W 4.6.6–4
Diff: 0 Page Ref: 293–298
Objective: (4.6) *Know Concepts L'Hopital's Rule

102) D
ID: TCALC11W 4.3.5–4
Diff: 0 Page Ref: 263–267
Objective: (4.3) Find Location of Local Extrema

103) B
ID: TCALC11W 4.8.11–7
Diff: 0 Page Ref: 308–315
Objective: (4.8) Multi–Part Questions: Applications of Derivatives

104) C
ID: TCALC11W 4.8.9–1
Diff: 0 Page Ref: 308–315
Objective: (4.8) *Know Concepts: Antiderivatives

105) C
ID: TCALC11W 4.4.2–4
Diff: 0 Page Ref: 268–275
Objective: (4.4) Sketch Graph, Identify Extrema, Inflection Points

106) C
ID: TCALC11W 4.6.1–8
Diff: 0 Page Ref: 293–298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

107) B
ID: TCALC11W 4.5.2–2
Diff: 0 Page Ref: 279–286
Objective: (4.5) Solve Apps: Physical Applications

108) D
ID: TCALC11W 4.5.4–3
Diff: 0 Page Ref: 279–286
Objective: (4.5) *Know Concepts: Extrema/Optimization

109) C
ID: TCALC11W 4.8.1–1
Diff: 0 Page Ref: 308–315
Objective: (4.8) Find Antiderivative

110) C
ID: TCALC11W 4.4.1–1
Diff: 0 Page Ref: 268–275
Objective: (4.4) Identify Inflection Points and Local Extrema Given Graph

111) C
ID: TCALC11W 4.6.4–2
Diff: 0 Page Ref: 293–298
Objective: (4.6) Find Continuous Extension

112) B
ID: TCALC11W 4.8.7–4
Diff: 0 Page Ref: 308–315
Objective: (4.8) Solve Apps: Particle Kinematics I

113) C
ID: TCALC11W 4.8.9–3
Diff: 0 Page Ref: 308–315
Objective: (4.8) *Know Concepts: Antiderivatives

114) C
ID: TCALC11W 4.8.5–10
Diff: 0 Page Ref: 308–315
Objective: (4.8) Solve Initial Value Problem

115) A
ID: TCALC11W 4.8.1–8
Diff: 0 Page Ref: 308–315
Objective: (4.8) Find Antiderivative

116) A
ID: TCALC11W 4.5.1–1
Diff: 0 Page Ref: 279–286
Objective: (4.5) Solve Apps: Geometry

117) A
ID: TCALC11W 4.5.1–2
Diff: 0 Page Ref: 279–286
Objective: (4.5) Solve Apps: Geometry

118) D
ID: TCALC11W 4.6.4–3
Diff: 0 Page Ref: 293–298
Objective: (4.6) Find Continuous Extension

119) B
ID: TCALC11W 4.4.1–4
Diff: 0 Page Ref: 268–275
Objective: (4.4) Identify Inflection Points and Local Extrema Given Graph

120) D
ID: TCALC11W 4.7.1-4
Diff: 0 Page Ref: 300-306
Objective: (4.7) Use Newton's Method I

121) C
ID: TCALC11W 4.4.2-5
Diff: 0 Page Ref: 268-275
Objective: (4.4) Sketch Graph, Identify Extrema, Inflection Points

122) B
ID: TCALC11W 4.2.5-6
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

123) A
ID: TCALC11W 4.6.1-3
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

124) C
ID: TCALC11W 4.5.2-3
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Physical Applications

125) C
ID: TCALC11W 4.5.3-4
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Business and Economics

126) C
ID: TCALC11W 4.4.2-7
Diff: 0 Page Ref: 268-275
Objective: (4.4) Sketch Graph, Identify Extrema, Inflection Points

127) A
ID: TCALC11W 4.1.9-3
Diff: 0 Page Ref: 245-253
Objective: (4.1) Tech: Graph and Find Extrema of Absolute Value Function

128) A
ID: TCALC11W 4.1.2-7
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extremum from Graph

129) D
ID: TCALC11W 4.1.5-6
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

130) A
ID: TCALC11W 4.8.3-3
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

131) C
ID: TCALC11W 4.1.4-4
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

132) A
ID: TCALC11W 4.3.2-2
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Determine Monotonic Intervals

133) A
ID: TCALC11W 4.1.2-9
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extremum from Graph

134) A
ID: TCALC11W 4.8.3-9
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

135) D
ID: TCALC11W 4.3.6-2
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Location of Extreme Values on Half-Open Interval

136) C
ID: TCALC11W 4.5.1-4
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Geometry

137) C
ID: TCALC11W 4.3.5-3
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Location of Local Extrema

138) B
ID: TCALC11W 4.2.5-2
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

139) B
ID: TCALC11W 4.8.1-4
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Antiderivative

140) B
ID: TCALC11W 4.8.8-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics II

141) A
ID: TCALC11W 4.3.1-1
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Find Critical Points

142) A
ID: TCALC11W 4.3.4-10
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

143) B
ID: TCALC11W 4.4.2-2
Diff: 0 Page Ref: 268-275
Objective: (4.4) Sketch Graph, Identify Extrema, Inflection Points

144) B
ID: TCALC11W 4.1.7-4
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

145) C
ID: TCALC11W 4.8.10-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Tech: Solve Initial Value Problem

146) B
ID: TCALC11W 4.1.7-9
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

147) C
ID: TCALC11W 4.6.4-6
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Continuous Extension

148) A
ID: TCALC11W 4.8.7-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics I

149) B
ID: TCALC11W 4.5.2-5
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Physical Applications

150) C
ID: TCALC11W 4.8.2-10
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

151) B
ID: TCALC11W 4.6.1-5
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

152) C
ID: TCALC11W 4.1.7-7
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

153) A
ID: TCALC11W 4.2.5-3
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

154) D
ID: TCALC11W 4.3.4-4
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

155) A
ID: TCALC11W 4.2.2-1
Diff: 0 Page Ref: 256-261
Objective: (4.2) Determine if Function Satisfies Hypothesis of Mean Value Theorem

156) B
ID: TCALC11W 4.8.2-8
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

157) C
ID: TCALC11W 4.3.3-2
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Locate Relative Extrema

158) B
ID: TCALC11W 4.1.6-1
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Critical Points and Local Extreme Values

159) D
ID: TCALC11W 4.6.4-7
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Continuous Extension

160) B
ID: TCALC11W 4.2.5-7
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

161) B
ID: TCALC11W 4.7.1-2
Diff: 0 Page Ref: 300-306
Objective: (4.7) Use Newton's Method I

162) A
ID: TCALC11W 4.1.5-10
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

163) C
ID: TCALC11W 4.3.5-1
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Location of Local Extrema

164) C
ID: TCALC11W 4.7.1-6
Diff: 0 Page Ref: 300-306
Objective: (4.7) Use Newton's Method I

165) B
ID: TCALC11W 4.7.1-3
Diff: 0 Page Ref: 300-306
Objective: (4.7) Use Newton's Method I

166) C
ID: TCALC11W 4.4.2-3
Diff: 0 Page Ref: 268-275
Objective: (4.4) Sketch Graph, Identify Extrema, Inflection Points

167) A
ID: TCALC11W 4.1.5-2
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

168) A
ID: TCALC11W 4.8.3-8
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

169) D
ID: TCALC11W 4.2.5-8
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

170) B
ID: TCALC11W 4.8.1-10
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Antiderivative

171) D
ID: TCALC11W 4.6.1-10
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

172) C
ID: TCALC11W 4.6.3-2
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Limit (L'Hopital's Rule not Applicable)

173) D
ID: TCALC11W 4.6.3-9
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Limit (L'Hopital's Rule not Applicable)

174) A
ID: TCALC11W 4.6.3-5
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Limit (L'Hopital's Rule not Applicable)

175) C
ID: TCALC11W 4.8.2-4
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

176) A
ID: TCALC11W 4.8.3-1
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

177) D
ID: TCALC11W 4.4.1-5
Diff: 0 Page Ref: 268-275
Objective: (4.4) Identify Inflection Points and Local Extrema Given Graph

178) D
ID: TCALC11W 4.8.5-5
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Initial Value Problem

179) A
ID: TCALC11W 4.2.7-8
Diff: 0 Page Ref: 256-261
Objective: (4.2) Solve Apps: Particle Kinematics

180) B
ID: TCALC11W 4.2.2-2
Diff: 0 Page Ref: 256-261
Objective: (4.2) Determine if Function Satisfies Hypothesis of Mean Value Theorem

181) A
ID: TCALC11W 4.1.4-10
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

182) B
ID: TCALC11W 4.1.6-4
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Critical Points and Local Extreme Values

183) C
ID: TCALC11W 4.4.1-2
Diff: 0 Page Ref: 268-275
Objective: (4.4) Identify Inflection Points and Local Extrema Given Graph

184) D
ID: TCALC11W 4.3.4-7
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

185) A
ID: TCALC11W 4.2.2-4
Diff: 0 Page Ref: 256-261
Objective: (4.2) Determine if Function Satisfies Hypothesis of Mean Value Theorem

186) B
ID: TCALC11W 4.6.4-5
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Continuous Extension

187) D
ID: TCALC11W 4.3.3-5
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Locate Relative Extrema

188) B
ID: TCALC11W 4.8.5-1
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Initial Value Problem

189) C
ID: TCALC11W 4.6.2-5
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule To Find Limit II

190) D
ID: TCALC11W 4.6.2-6
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule To Find Limit II

191) C
ID: TCALC11W 4.2.5-5
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

192) A
ID: TCALC11W 4.2.6-7
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find Function Given Derivative and Point

193) C
ID: TCALC11W 4.8.7-9
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics I

194) C
ID: TCALC11W 4.8.5-7
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Initial Value Problem

195) B
ID: TCALC11W 4.8.7-7
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics I

196) C
ID: TCALC11W 4.3.4-6
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

197) C
ID: TCALC11W 4.2.5-4
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

198) D
ID: TCALC11W 4.3.3-4
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Locate Relative Extrema

199) C
ID: TCALC11W 4.8.7-6
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics I

200) D
ID: TCALC11W 4.4.2-6
Diff: 0 Page Ref: 268-275
Objective: (4.4) Sketch Graph, Identify Extrema, Inflection Points

201) A
ID: TCALC11W 4.1.2-8
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extremum from Graph

202) B
ID: TCALC11W 4.6.1-1
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

203) B
ID: TCALC11W 4.1.4-9
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

204) C
ID: TCALC11W 4.1.4-5
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

205) A
ID: TCALC11W 4.1.2-5
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extremum from Graph

206) B
ID: TCALC11W 4.3.4-5
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

207) A
ID: TCALC11W 4.1.7-5
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

208) B
ID: TCALC11W 4.3.3-6
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Locate Relative Extrema

209) A
ID: TCALC11W 4.1.7-3
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

210) A
ID: TCALC11W 4.8.1-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Antiderivative

211) B
ID: TCALC11W 4.2.5-10
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

212) D
ID: TCALC11W 4.5.3-1
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Business and Economics

213) B
ID: TCALC11W 4.8.5-8
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Initial Value Problem

214) B
ID: TCALC11W 4.8.2-9
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

215) C
ID: TCALC11W 4.5.1-7
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Geometry

216) A
ID: TCALC11W 4.1.2-4
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extremum from Graph

217) D
ID: TCALC11W 4.8.8-5
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics II

218) A
ID: TCALC11W 4.6.3-6
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Limit (L'Hopital's Rule not Applicable)

219) D
ID: TCALC11W 4.4.2-1
Diff: 0 Page Ref: 268-275
Objective: (4.4) Sketch Graph, Identify Extrema, Inflection Points

220) D
ID: TCALC11W 4.1.5-4
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

221) D
ID: TCALC11W 4.1.7-6
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

222) B
ID: TCALC11W 4.2.5-1
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

223) C
ID: TCALC11W 4.6.3-7
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Limit (L'Hopital's Rule not Applicable)

224) C
ID: TCALC11W 4.5.1-8
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Geometry

225) C
ID: TCALC11W 4.3.3-3
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Locate Relative Extrema

226) D
ID: TCALC11W 4.8.7-5
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics I

227) A
ID: TCALC11W 4.2.6-6
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find Function Given Derivative and Point

228) A
ID: TCALC11W 4.8.3-6
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

229) A
ID: TCALC11W 4.2.3-1
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find and Plot Roots of Polynomial Function and Its First Derivative

230) C
ID: TCALC11W 4.1.2-6
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extremum from Graph

231) B
ID: TCALC11W 4.8.5-6
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Initial Value Problem

232) C
ID: TCALC11W 4.2.7-9
Diff: 0 Page Ref: 256-261
Objective: (4.2) Solve Apps: Particle Kinematics

233) A
ID: TCALC11W 4.8.7-3
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics I

234) B
ID: TCALC11W 4.2.6-1
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find Function Given Derivative and Point

235) A
ID: TCALC11W 4.2.7-2
Diff: 0 Page Ref: 256-261
Objective: (4.2) Solve Apps: Particle Kinematics

236) D
ID: TCALC11W 4.2.5-9
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find All Functions with Indicated Derivative

237) A
ID: TCALC11W 4.2.7-4
Diff: 0 Page Ref: 256-261
Objective: (4.2) Solve Apps: Particle Kinematics

238) D
ID: TCALC11W 4.1.5-9
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

239) D
ID: TCALC11W 4.5.2-6
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Physical Applications

240) A
ID: TCALC11W 4.8.3-7
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

241) C
ID: TCALC11W 4.1.4-8
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

242) D
ID: TCALC11W 4.5.3-3
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Business and Economics

243) C
ID: TCALC11W 4.8.5-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Initial Value Problem

244) D
ID: TCALC11W 4.1.5-1
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

245) D
ID: TCALC11W 4.4.1-3
Diff: 0 Page Ref: 268-275
Objective: (4.4) Identify Inflection Points and Local Extrema Given Graph

246) B
ID: TCALC11W 4.6.3-8
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Limit (L'Hopital's Rule not Applicable)

247) D
ID: TCALC11W 4.1.6-6
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Critical Points and Local Extreme Values

248) A
ID: TCALC11W 4.8.10-1
Diff: 0 Page Ref: 308-315
Objective: (4.8) Tech: Solve Initial Value Problem

249) D
ID: TCALC11W 4.3.6-1
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Location of Extreme Values on Half-Open Interval

250) D
ID: TCALC11W 4.6.1-7
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

251) D
ID: TCALC11W 4.1.6-2
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Critical Points and Local Extreme Values

252) A
ID: TCALC11W 4.2.1-1
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find c in f'(c) =(f(b) - f(a))/(b - a)

253) D
ID: TCALC11W 4.6.3-1
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Limit (L'Hopital's Rule not Applicable)

254) B
ID: TCALC11W 4.2.3-2
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find and Plot Roots of Polynomial Function and Its First Derivative

255) C
ID: TCALC11W 4.8.5-9
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Initial Value Problem

256) A
ID: TCALC11W 4.5.3-2
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Business and Economics

257) B
ID: TCALC11W 4.7.1-5
Diff: 0 Page Ref: 300-306
Objective: (4.7) Use Newton's Method I

258) D
ID: TCALC11W 4.6.1-4
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

259) D
ID: TCALC11W 4.5.4-1
Diff: 0 Page Ref: 279-286
Objective: (4.5) *Know Concepts: Extrema/Optimization

260) A
ID: TCALC11W 4.1.4-2
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

261) C
ID: TCALC11W 4.6.3-3
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Limit (L'Hopital's Rule not Applicable)

262) A
ID: TCALC11W 4.8.8-3
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics II

263) C
ID: TCALC11W 4.5.1-6
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Geometry

264) B
ID: TCALC11W 4.3.1-2
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Find Critical Points

265) C
ID: TCALC11W 4.1.9-1
Diff: 0 Page Ref: 245-253
Objective: (4.1) Tech: Graph and Find Extrema of Absolute Value Function

266) A
ID: TCALC11W 4.8.2-5
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

267) A
ID: TCALC11W 4.1.6-7
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Critical Points and Local Extreme Values

268) B
ID: TCALC11W 4.1.2-3
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extremum from Graph

269) C
ID: TCALC11W 4.5.2-1
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Physical Applications

270) C
ID: TCALC11W 4.1.9-2
Diff: 0 Page Ref: 245-253
Objective: (4.1) Tech: Graph and Find Extrema of Absolute Value Function

271) A
ID: TCALC11W 4.8.5-3
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Initial Value Problem

272) B
ID: TCALC11W 4.2.6-2
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find Function Given Derivative and Point

273) D
ID: TCALC11W 4.6.3-4
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Limit (L'Hopital's Rule not Applicable)

274) C
ID: TCALC11W 4.1.7-1
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

275) A
ID: TCALC11W 4.6.1-6
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

276) D
ID: TCALC11W 4.1.5-7
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

277) C
ID: TCALC11W 4.8.9-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) *Know Concepts: Antiderivatives

278) D
ID: TCALC11W 4.6.1-2
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

279) C
ID: TCALC11W 4.3.4-1
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

280) D
ID: TCALC11W 4.7.1-1
Diff: 0 Page Ref: 300-306
Objective: (4.7) Use Newton's Method I

281) C
ID: TCALC11W 4.1.4-1
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

282) A
ID: TCALC11W 4.8.2-6
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

283) A
ID: TCALC11W 4.8.11-6
Diff: 0 Page Ref: 308-315
Objective: (4.8) Multi-Part Questions: Applications of Derivatives

284) A
ID: TCALC11W 4.8.3-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

285) D
ID: TCALC11W 4.8.8-1
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics II

286) D
ID: TCALC11W 4.5.3-5
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Business and Economics

287) A
ID: TCALC11W 4.6.4-4
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Continuous Extension

288) D
ID: TCALC11W 4.3.4-8
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

289) A
ID: TCALC11W 4.5.1-9
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Geometry

290) C
ID: TCALC11W 4.1.5-3
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

291) C
ID: TCALC11W 4.6.1-9
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule to Find Limit I

292) C
ID: TCALC11W 4.6.2-3
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule To Find Limit II

293) C
ID: TCALC11W 4.8.7-1
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics I

294) D
ID: TCALC11W 4.1.5-8
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

295) C
ID: TCALC11W 4.8.2-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

296) C
ID: TCALC11W 4.1.6-5
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Critical Points and Local Extreme Values

297) A
ID: TCALC11W 4.6.4-1
Diff: 0 Page Ref: 293-298
Objective: (4.6) Find Continuous Extension

298) B
ID: TCALC11W 4.5.3-7
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Business and Economics

299) C
ID: TCALC11W 4.2.7-7
Diff: 0 Page Ref: 256-261
Objective: (4.2) Solve Apps: Particle Kinematics

300) A
ID: TCALC11W 4.3.4-9
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

301) A
ID: TCALC11W 4.8.3-5
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

302) D
ID: TCALC11W 4.1.4-6
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

303) C
ID: TCALC11W 4.8.7-8
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics I

304) A
ID: TCALC11W 4.6.2-2
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule To Find Limit II

305) A
ID: TCALC11W 4.1.7-2
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

306) D
ID: TCALC11W 4.8.6-2
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Plane Curve with Given Properties

307) A
ID: TCALC11W 4.2.7-1
Diff: 0 Page Ref: 256-261
Objective: (4.2) Solve Apps: Particle Kinematics

308) C
ID: TCALC11W 4.8.1-5
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Antiderivative

309) B
ID: TCALC11W 4.8.3-10
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

310) B
ID: TCALC11W 4.8.2-3
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

311) C
ID: TCALC11W 4.2.7-6
Diff: 0 Page Ref: 256-261
Objective: (4.2) Solve Apps: Particle Kinematics

312) B
ID: TCALC11W 4.5.2-4
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Physical Applications

313) A
ID: TCALC11W 4.8.1-7
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Antiderivative

314) C
ID: TCALC11W 4.8.2-7
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

315) B
ID: TCALC11W 4.3.3-1
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Locate Relative Extrema

316) A
ID: TCALC11W 4.1.2-1
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extremum from Graph

317) A
ID: TCALC11W 4.6.2-4
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule To Find Limit II

318) C
ID: TCALC11W 4.2.6-5
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find Function Given Derivative and Point

319) C
ID: TCALC11W 4.6.2-1
Diff: 0 Page Ref: 293-298
Objective: (4.6) Use L'Hopital's Rule To Find Limit II

320) C
ID: TCALC11W 4.8.8-4
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics II

321) A
ID: TCALC11W 4.2.2-3
Diff: 0 Page Ref: 256-261
Objective: (4.2) Determine if Function Satisfies Hypothesis of Mean Value Theorem

322) A
ID: TCALC11W 4.8.5-4
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Initial Value Problem

323) A
ID: TCALC11W 4.1.4-7
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

324) A
ID: TCALC11W 4.1.2-2
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extremum from Graph

325) B
ID: TCALC11W 4.8.1-6
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Antiderivative

326) D
ID: TCALC11W 4.2.7-3
Diff: 0 Page Ref: 256-261
Objective: (4.2) Solve Apps: Particle Kinematics

327) D
ID: TCALC11W 4.1.9-4
Diff: 0 Page Ref: 245-253
Objective: (4.1) Tech: Graph and Find Extrema of Absolute Value Function

328) B
ID: TCALC11W 4.3.5-2
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Location of Local Extrema

329) C
ID: TCALC11W 4.8.7-10
Diff: 0 Page Ref: 308-315
Objective: (4.8) Solve Apps: Particle Kinematics I

330) D
ID: TCALC11W 4.3.3-7
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Locate Relative Extrema

331) B
ID: TCALC11W 4.2.6-4
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find Function Given Derivative and Point

332) D
ID: TCALC11W 4.8.1-3
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Antiderivative

333) D
ID: TCALC11W 4.1.4-3
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Absolute Extrema on Interval

334) D
ID: TCALC11W 4.2.6-3
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find Function Given Derivative and Point

335) A
ID: TCALC11W 4.3.2-1
Diff: 0 Page Ref: 263-267
Objective: (4.3) Analyze f(x) Given f'(x): Determine Monotonic Intervals

336) D
ID: TCALC11W 4.5.3-6
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Business and Economics

337) D
ID: TCALC11W 4.8.2-1
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Indefinite Integral

338) D
ID: TCALC11W 4.1.6-3
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Critical Points and Local Extreme Values

339) D
ID: TCALC11W 4.2.6-8
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find Function Given Derivative and Point

340) D
ID: TCALC11W 4.3.4-2
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

341) B
ID: TCALC11W 4.1.7-10
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

342) D
ID: TCALC11W 4.1.5-5
Diff: 0 Page Ref: 245-253
Objective: (4.1) Find Values and Locations of Extrema

343) B
ID: TCALC11W 4.2.7-5
Diff: 0 Page Ref: 256-261
Objective: (4.2) Solve Apps: Particle Kinematics

344) D
ID: TCALC11W 4.8.1-9
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Antiderivative

345) B
ID: TCALC11W 4.5.3-8
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Business and Economics

346) A
ID: TCALC11W 4.8.6-1
Diff: 0 Page Ref: 308-315
Objective: (4.8) Find Plane Curve with Given Properties

347) B
ID: TCALC11W 4.8.3-4
Diff: 0 Page Ref: 308-315
Objective: (4.8) Check Antiderivative Formula (Y/N)

348) A
ID: TCALC11W 4.1.7-8
Diff: 0 Page Ref: 245-253
Objective: (4.1) Solve Apps: Extreme Values

349) B
ID: TCALC11W 4.5.1-5
Diff: 0 Page Ref: 279-286
Objective: (4.5) Solve Apps: Geometry

350) D
ID: TCALC11W 4.3.4-3
Diff: 0 Page Ref: 263-267
Objective: (4.3) Find Monotonic Intervals of f(x)

351) B
ID: TCALC11W 4.2.1-2
Diff: 0 Page Ref: 256-261
Objective: (4.2) Find c in f'(c) =(f(b) - f(a))/(b - a)