Exam

Name______________________________

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

Referring to the table of integrals at the back of the book, derive the specified formula. Show all steps clearly in your solution.

1) Derive a formula by using the substitution u = ax + b to evaluate 1) ____________

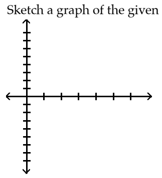
$$\int x\,(ax+b)^n\,dx \qquad (n \neq -1, -2)$$

Provide an appropriate response.

2) A tank which initially contains 225 gallons of water is drained according to the drainage rate information given in the table below. 2)

Time (h)	0	1	2	3	4	5	6
Drainage rate (gal/h)	40.9	33.5	27.4	22.5	18.4	15.1	12.3

(a) Use a trapezoidal approximation to estimate the amount of water that has been drained during the first six hours.
(b) Assuming that after six hours the water continues to drain at the rate of 12.3 gallons per hour, use your estimate from part (a) to find the total amount of time it takes to drain the tank completely.
(c) Sketch a graph of the given drainage rate data.



(d) Assume that the drainage rate is given by a smooth function r, where the graph of y = r(t) passes through the points you drew in part (c). Tell whether each of your answers to parts (a) and (b) are underestimates or overestimates. Explain.

3) Let $f(x) = \frac{1}{x^2}$, $x \geq 1$. 3) ____________

(a) Find the area of the region between the graph of y = f(x) and the x-axis.
(b) If the region described in part (a) is revolved about the x-axis, what is the volume of the solid that is generated?
(c) A surface is generated by revolving the graph of y = f(x) about the x-axis. Write an integral expression for the surface area and show that the integral converges.
(d) Use numerical techniques to estimate the area of the region in part (c), to an accuracy of at least two decimal places.

4) The Cauchy density function, $f(x) = \frac{1}{\pi(1+x^2)}$, occurs in probability theory. Show that 4) ____________

$$\int_{-\infty}^{\infty} \frac{1}{\pi(1+x^2)}\,dx = 1.$$

Use a calculator or computer with a numerical integration routine to estimate the value of the integral. Round your answer to five decimal places.

5) $\int_0^1 e^{-x^2}\,dx$ 5) ____________

Provide an appropriate response.

6) The standard normal probability density function is defined by $f(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}$. 6) ____________

(a) Show that $\int_0^{\infty} \frac{1}{\sqrt{2\pi}}\, x\, e^{-x^2/2}\,dx = \frac{1}{\sqrt{2\pi}}$.

(b) Use the result in part (a) to show that the standard normal probability density function has mean 0.

Use a calculator or computer with a numerical integration routine to estimate the value of the integral. Round your answer to five decimal places.

7) $\int_{-2}^{2} \sqrt{4-x^2}\,dx$ 7) ____________

Provide an appropriate response.

8) The natural logarithm of 3 is the value of the integral $\ln 3 = \int_1^3 \frac{dx}{x}$. Find an upper bound for the error incurred in estimating the integral using Simpson's Rule with n = 10 steps. 8) ____________

9) The standard normal probability density function is defined by $f(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}$. 9) ____________

(a) Use the fact that $\int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-x^2/2}\,dx = 1$ to show that $\int_0^{\infty} \frac{1}{\sqrt{2\pi}} x^2 e^{-x^2/2}\,dx = \frac{1}{2}$.

(b) Use the result in part (a) to show that the standard normal probability density function has variance 1.

Referring to the table of integrals at the back of the book, derive the specified formula. Show all steps clearly in your solution.

10) Derive a formula by using the substitution u = ax + b to evaluate 10) ____________

$$\int x\,(ax+b)^{-1}\,dx$$

Use a calculator or computer with a numerical integration routine to estimate the value of the integral. Round your answer to five decimal places.

11) $\int_{\pi/2}^{\pi} \frac{\cos x}{x}\,dx$ 11) ____________

Referring to the table of integrals at the back of the book, derive the specified formula. Show all steps clearly in your solution.

12) Derive a formula by using a trigonometric substitution to evaluate 12) ____________

$$\int \frac{x^2}{\sqrt{a^2 - x^2}}\,dx$$

Provide an appropriate response.

13) i) Show that $\int_0^{\infty} \frac{4x^3}{x^4+1}dx$ diverges, and hence $\int_{-\infty}^{\infty} \frac{4x^3}{x^4+1}dx$ diverges. 13) ____________

ii) Show that $\lim_{b\to\infty} \int_{-b}^{b} \frac{4x^3}{x^4+1}dx = 0$.

14) A student wishes to find the integral $\int_0^{+\infty} f(x)\,dx$ of a function that has the property limit $\lim_{x\to+\infty} f(x) = 1$. Why can this not be done? 14) ____________

15) How large must n be in order to guarantee that $|E_S| \leq 0.0001$ when Simpson's Rule is used to estimate $\ln 3 = \int_1^3 \frac{dx}{x}$? 15) ____________

16) How large must n be in order to guarantee that $|E_T| \leq 0.001$ when the Trapezoidal Rule is used to estimate $\ln 3 = \int_1^3 \frac{dx}{x}$? 16) ____________

Use a calculator or computer with a numerical integration routine to estimate the value of the integral. Round your answer to five decimal places.

17) $\int_0^{\pi} \cos(x^2)\,dx$ 17) ____________

Provide an appropriate response.

18) Here is an argument that ln 2 = ∞ − ∞. Where does the argument go wrong? 18) ____________

$$\ln 2 = \ln 1 + \ln 2 = \ln 1 - \ln \frac{1}{2}$$

$$= \lim_{b\to\infty} \ln\left(\frac{b-1}{b}\right) - \ln\frac{1}{2}$$

$$= \lim_{b\to\infty} \left[\ln \frac{x-1}{x}\right]_2^b$$

$$= \lim_{b\to\infty} \left[\ln(x-1) - \ln x\right]_2^b$$

$$= \lim_{b\to\infty} \int_2^b \left(\frac{1}{x-1} - \frac{1}{x}\right)dx$$

$$= \int_2^{\infty} \left(\frac{1}{x-1} - \frac{1}{x}\right)dx$$

$$= \int_2^{\infty} \frac{1}{x-1}\,dx - \int_2^{\infty} \frac{1}{x}\,dx$$

$$= \lim_{b\to\infty} \left[\ln(x-1)\right]_2^b - \lim_{b\to\infty} \left[\ln x\right]_2^b$$

$$= \infty - \infty$$

19) The natural logarithm of 3 is the value of the integral $\ln 3 = \int_1^3 \frac{dx}{x}$. Find an upper bound for the error incurred in estimating the integral using the Trapezoidal Rule with n = 10 steps. 19) ____________

20) A student wishes to take the integral over all real numbers of $f(x) = \begin{cases} \frac{1}{x}, & \text{if } x < 0 \\ \frac{1}{x^2}, & \text{if } x > 0 \end{cases}$ and claims this is zero because −∞ + ∞ equals zero. What is wrong with this thinking? 20) ____________

Referring to the table of integrals at the back of the book, derive the specified formula. Show all steps clearly in your solution.

21) Derive a formula by evaluating 21) ____________

$$\int x^n \sinh ax\,dx$$

by integration by parts.

Provide an appropriate response.

22) (a) Show that $\int_2^{\infty} e^{-2x}\,dx = \frac{1}{2}e^{-4} < 0.0092$ and hence that $\int_2^{\infty} e^{-x^2}\,dx < 0.0092$. 22) ______

(b) Explain why this means that $\int_0^{\infty} e^{-x^2}\,dx$ can be replaced by $\int_0^{2} e^{-x^2}\,dx$ without introducing an error of magnitude greater than 0.0092.

23) A student claims that $\int_a^b f(x)\,dx$ always exists, as long as a and b are both positive. 23) ______

Refute this by giving an example of a function for which this is not true.

24) Show that $\int_{-\infty}^{3} \frac{dx}{1+x^2} + \int_{3}^{\infty} \frac{dx}{1+x^2} = \int_{-\infty}^{5} \frac{dx}{1+x^2} + \int_{5}^{\infty} \frac{dx}{1+x^2}$. 24) ______

25) A student needs $\int_{-\infty}^{+\infty} e^{-|x|}\,dx$. Is this integral the same as $2\int_0^{+\infty} e^{-|x|}\,dx$, and if so, why? 25) ______

Referring to the table of integrals at the back of the book, derive the specified formula. Show all steps clearly in your solution.

26) Derive a formula by evaluating 26) ______

$$\int x^n \tan^{-1} ax\,dx$$

by integration by parts.

Provide an appropriate response.

27) You wish to estimate the integral $\int_0^{\pi/2} x\cos x\,dx$ by using the Trapezoidal Rule with n = 8 steps. 27) ______

a) Find an upper bound for $|f''(x)|$ on $[0, \pi/2]$ by reasoning as follows:

$|f''(x)| = |-2\sin x - x\cos x|$

$\leq 2|\sin x| + |x|\,|\cos x|$

b) Use the upper bound for $|f''(x)|$ that you obtained in part a) to find an upper bound for the error, $|E_T|$ incurred in estimating the integral by the Trapezoidal Rule. How do you think that the actual error will compare to this upper bound?

c) Find an improved upper bound for $|f''(x)|$ on $[0, \pi/2]$ by graphing the function $f''(x) = -2\sin x - x\cos x$ on a graphing calculator and estimating the maximum value of $|f''(x)|$. Use this improved upper bound to obtain an improved upper bound for the error, $|E_T|$.

d) Use the Trapezoidal Rule with n = 8 steps to estimate the integral.

e) The exact value of the integral is $\frac{\pi}{2} - 1$. Determine the error, $|E_T|$, in your estimate in part c)

f) How does the actual error compare to each of your error estimates in parts b) and c) ?

Referring to the table of integrals at the back of the book, derive the specified formula. Show all steps clearly in your solution.

28) Derive a formula by using a trigonometric substitution to evaluate 28) ______

$$\int \frac{\sqrt{a^2 - x^2}}{x^2}\,dx$$

Provide an appropriate response.

29) (a) Show that $\int_0^{\infty} \frac{dx}{x^3+1}$ converges. 29) ______

(b) Show that $\int_{50}^{\infty} \frac{dx}{x^3+1} \leq 0.0002$.

(c) Suppose $\int_0^{\infty} \frac{dx}{x^3+1}$ is approximated by $\int_0^{50} \frac{dx}{x^3+1}$. Based on your answer to part (b), what is the maximum possible error?

(d) Use a numerical method to estimate the value of $\int_0^{\infty} \frac{dx}{x^3+1}$.

(e) Determine whether $\int_{-1}^{\infty} \frac{dx}{x^3+1}$ converges or diverges, and justify your answer. If it converges, estimate its value to an accuracy of at least two decimal places.

30) Explain why the Trapezoidal Rule gives an exact value for the integral $\int_{-1}^{1} (3x - 7)\,dx$. 30) ______

31) (a) Express $\frac{3x - 1}{x^2 - 3x - 10}$ as a sum of partial fractions. 31) ______

(b) Evaluate $\int \frac{3x - 1}{x^2 - 3x - 10}\,dx$.

(c) Evaluate $\int \frac{2x^2 - 3x - 21}{x^2 - 3x - 10}\,dx$.

(d) Find a solution to the initial value problem:

$\frac{dy}{dx} = \frac{3xy - y}{x^2 - 3x - 10}$, $y(4) = 12$.

Referring to the table of integrals at the back of the book, derive the specified formula. Show all steps clearly in your solution.

32) Derive a formula by evaluating 32) ______

$$\int x^n b^{ax}\,dx$$

by integration by parts.

Provide an appropriate response.

33) Explain why Simpson's Rule gives an exact value for the integral 33) ______

$\int_0^1 (2x^3 + 3x^2 - 7x + 1)\,dx$.

34) (a) Find the values of p for which $\int_0^1 \frac{1}{x^p}\,dx$ converges. 34) ______

(b) Find the values of p for which $\int_0^1 \frac{1}{x^p}\,dx$ diverges.

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

Determine whether the improper integral converges or diverges.

35) $\int_{15}^{\infty} \frac{dx}{\sqrt{e^x - x^3}}\,dx$ 35) ______

A) Converges B) Diverges

Use the substitution z = tan (x/2) to evaluate the integral.

36) $\int \frac{d\theta}{3 + \cos\theta}$ 36) ______

A) $\frac{\sqrt{2}}{2}\tan^{-1}\left(\frac{\sqrt{2}}{2}\tan\frac{x}{2}\right) + C$

B) $\frac{1}{2}\tan^{-1}\left(\frac{1}{2}\tan\frac{x}{2}\right) + C$

C) $\tan^{-1}\left(\frac{1}{2}\tan\frac{x}{2}\right) + C$

D) $\tan^{-1}\left(\frac{\sqrt{2}}{2}\tan\frac{x}{2}\right) + C$

Determine whether the improper integral converges or diverges.

37) $\int_1^{\infty} \frac{9e^x}{\ln x}\,dx$ 37) ______

A) Diverges B) Converges

Evaluate the integral.

38) $\int 7\sec^4 x\,dx$ 38) ______

A) $7(\sec x + \tan x)^5 + C$

B) $-\frac{7}{3}\tan^3 x + C$

C) $\frac{7}{3}\tan^3 x + C$

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

39) $\int x\,4^x\,dx$ 39) ______

A) $x(4^x) - 4^x + C$

B) $\frac{x^2(4^x)}{2(\ln 4)} + C$

C) $\frac{x(4^x)}{\ln 4} + \frac{4^x}{\ln^2 4} + C$

D) $\frac{x(4^x)}{\ln 4} - \frac{4^x}{\ln^2 4} + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

40) $\int \frac{48x^2 + 32x + 3}{(16x^2 + 1)^2}\,dx$ 40) ______

A) $\frac{3}{4}\tan^{-1}(4x) - \frac{1}{16x^2 + 1} + C$

B) $\frac{3}{4}\tan^{-1}(4x) - \frac{1}{16x^2 + 1} - \frac{1}{(16x^2 + 1)^2} + C$

C) $\frac{3}{4}\tan^{-1}(16x) + \frac{1}{16x^2 + 1} + C$

D) $\ln|16x^2 + 1| - \frac{1}{16x^2 + 1} + C$

Evaluate the integral by eliminating the square root.

41) $\int_0^{\pi/4} \sqrt{1 - \cos 4y}\,dy$ 41) ______

A) 4 B) $\frac{\sqrt{2}}{2}$ C) $\sqrt{2}$ D) $2\sqrt{2}$

Use your calculator to approximate the integral using the method indicated.

42) Trapezoidal Rule, $\int_1^3 x\ln x\,dx$, n = 100 42) ______

A) 2.8527 B) 2.9749 C) 2.9436 D) 2.858

Provide the proper response.

43) The error formula for the Trapezoidal Rule depends upon 43) ______

i) f(x).

ii) f'(x).

iii) f'' (x).

iv) the number of steps

A) i and iii B) ii and iv C) iii and iv D) i, iii, and iv

Evaluate the integral.

44) $\int \frac{10^{\ln x}}{x}\,dx$ 44) ______

A) $\frac{10^{\ln x}}{x\ln 10} + C$ B) $10^{\ln x} + C$ C) $\frac{10^{\ln x}}{x} + C$ D) $\frac{10^{\ln x}}{\ln 10} + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

45) $\int_0^4 \frac{3x^2 + x + 16}{(x^2 + 16)(x + 1)}\,dx$ 45) ______

A) 2.192 B) 1.786 C) 1.096 D) 4.384

Evaluate the integral by making a substitution and then using a table of integrals.

46) $\int \frac{\ln x}{x(10 + \ln x)}\,dx$ 46) ______

A) $\ln|x| - 10\ln|\ln|x| + 10| + C$

B) $\ln|x| + x - 10\ln|\ln|x| + 10| + C$

C) $-10\ln|\ln|x| + 10| + C$

D) $\ln|x| - 10\ln|x + 10| + C$

Determine whether the improper integral converges or diverges.

47) $\int_1^{\infty} \frac{x^6}{\sqrt{e^x - 1}}\,dx$ 47) ______

A) Converges B) Diverges

Solve the problem.

48) Find the area of the region between the curves $y = \tan^2 x$ and $y = \sec^2 x$ from $x = 0$ to $x = \frac{\pi}{5}$. 48) ______

A) π B) $\frac{\pi}{10}$ C) $\frac{\pi}{5}$ D) $\frac{\pi}{6}$

Evaluate the improper integral or state that it is divergent.

49) $\int_0^{\infty} \frac{4(1 + \tan^{-1}x)}{1 + x^2}\,dx$ 49) ______

A) $2\pi\left(1 + \frac{\pi}{4}\right)$ B) $4\ln\left(1 + \frac{\pi}{2}\right)$ C) 2π D) $2\left(1 + \frac{\pi}{2}\right)^2$

Use the substitution z = tan (x/2) to evaluate the integral.

50) $\int \frac{dx}{\sin x + \cos x}$ 50) ______

A) $2\ln\left|\frac{1 + \tan\frac{x}{2}}{\left(1 - \tan^2\frac{x}{2}\right)^{1/2}}\right| + C$

B) $\sqrt{2}\ln\left|\frac{\sqrt{2} - 1 + \tan\frac{x}{2}}{\left(1 + 2\tan\frac{x}{2} - \tan^2\frac{x}{2}\right)^{1/2}}\right| + C$

C) $\ln\left|\frac{\sqrt{2} - 1 + x}{(1 + 2x - x^2)^{1/2}}\right| + C$

D) $\sqrt{2}\ln\left|\frac{2 + \tan\frac{x}{2}}{\left(1 - 2\tan\frac{x}{2} - \tan^2\frac{x}{2}\right)^{1/2}}\right| + C$

Use a trigonometric substitution to evaluate the integral.

51) $\int_0^{\ln 3} \frac{e^x\,dx}{\sqrt{e^{2x} + 1}}$ 51) ______

A) $\ln 6 - \ln(1 + \sqrt{2})$ B) $\ln(e^3 + \sqrt{10})$

C) $\ln(3 + \sqrt{10}) - \ln(1 + \sqrt{2})$ D) $\ln\frac{3}{2}$

Evaluate the improper integral or state that it is divergent.

52) $\int_1^{\infty} \frac{4}{(1 + x^2)\tan^{-1}x}\,dx$ 52) ______

A) $2\left(1 + \frac{\pi}{2}\right)^2$ B) $4\ln\left(1 + \frac{\pi}{2}\right)$ C) $4\ln 2$ D) $4\ln\frac{\pi}{2}$

Solve the problem.

53) Find the volume of the solid generated by revolving the region in the first quadrant bounded by the x-axis and the curve $y = \sin 6x$, $0 \le x \le \pi/6$ about the line $x = \pi/6$. 53) ______

A) $\frac{1}{18}\pi^2 - \pi$ B) $\frac{1}{18}\pi$ C) $\frac{1}{18}\pi^2$ D) $\frac{\pi^2}{36}$

54) Estimate the minimum number of subintervals needed to approximate the integral 54) ______

$\int_1^2 (5x^4 - 6x)\,dx$

with an error of magnitude less than 10^{-4} using Simpson's Rule.

A) 22 B) 14 C) 10 D) 12

Solve the initial value problem for y as a function of x.

55) $(4 - x^2)\frac{dy}{dx} = 1$, $y(0) = 3$ 55) ______

A) $y = \frac{1}{4}\ln\left|\frac{x + 2}{x - 2}\right|$ B) $y = \frac{x}{4\sqrt{4 - x^2}} + 3$

C) $y = \frac{1}{4}\ln\left|\frac{x + 2}{x - 2}\right| + 3$ D) $y = \frac{1}{2}\ln|\sec x + \tan x| + 3$

Use a trigonometric substitution to evaluate the integral.

56) $\int_{1/e}^{1} \frac{dy}{25y - y(\ln y)^2}$ 56) ______

A) 0.039 B) 0.041 C) 0.197 D) −0.405

Express the integrand as a sum of partial fractions and evaluate the integral.

57) $\int \frac{dx}{x^2(x^2 - 16)}$ 57) ______

A) $\frac{1}{16x} + \frac{1}{128}\ln\left|\frac{x + 4}{x - 4}\right| + C$ B) $\frac{1}{16x} + \frac{1}{64}\ln\left|\frac{x - 4}{x + 4}\right| + C$

C) $\frac{1}{16x} + \frac{1}{128}\ln\left|\frac{x - 4}{x + 4}\right| + C$ D) $\frac{1}{32x} + \frac{1}{128}\ln\left|\frac{x - 4}{x + 4}\right| + C$

Evaluate the integral by separating the fraction and using a substitution if necessary.

58) $\int_{\pi/6}^{\pi/4} \frac{\cos\theta - 1}{\sin^2\theta}\,d\theta$ 58) ______

A) $3 - \sqrt{6}$ B) $3 - \sqrt{2} + \sqrt{3}$ C) $-3 + \sqrt{2} + \sqrt{3}$ D) $3 - \sqrt{2} - \sqrt{3}$

Express the integrand as a sum of partial fractions and evaluate the integral.

59) $\int_5^{10} \frac{8}{x^2 - 16}\,dx$ 59) ______

A) 5.350 B) 3.547 C) 1.350 D) −1.350

Evaluate the integral.

60) $\int \csc^2 7\theta \cot 7\theta\,d\theta$ 60) ______

A) $-\frac{1}{14}\tan^2 7\theta + C$ B) $\frac{1}{14}\cot^2\theta + C$

C) $\frac{1}{6}\csc^3 7\theta\cot^2 7\theta + C$ D) $-\frac{1}{14}\cot^2 7\theta + C$

Evaluate the improper integral or state that it is divergent.

61) $\int_{-\infty}^{0} 19xe^{3x}\,dx$ 61) ______

A) −2.1111 B) Divergent C) −4.667 D) 0.3333

Evaluate the integral by using a substitution prior to integration by parts.

62) $\int \frac{x^2}{\sqrt{x^2 + 14}}\,dx$ 62) ______

A) $\frac{3x}{2}\sqrt{x^2 + 14} - 7\ln(x + \sqrt{x^2 + 14}) + C$ B) $\frac{x}{2}\sqrt{x^2 + 14} + 7\ln(x + \sqrt{x^2 + 14}) + C$

C) $\frac{x}{2}\sqrt{x^2 + 14} - 7\ln(x + \sqrt{x^2 + 14}) + C$ D) $\frac{3x}{2}\sqrt{x^2 + 14} + 7\ln(x + \sqrt{x^2 + 14}) + C$

Determine whether the improper integral converges or diverges.

63) $\int_{-\infty}^{0} 19e^{5x}\,dx$ 63) ______

A) Diverges B) Converges

Solve the problem.

64) A surveyor measured the length of a piece of land at 100-ft intervals (x), as shown in the table. Use the Simpson's Rule to estimate the area of the piece of land in square feet. 64) ______

x	Length (ft)
0	60
100	70
200	90
300	65
400	60

A) 34,500 ft^2 B) 29,000 ft^2 C) 28,000 ft^2 D) 28,500 ft^2

65) Estimate the minimum number of subintervals needed to approximate the integral 65) ______

$\int_1^4 (5x^2 + 8)\,dx$

with an error of magnitude less than 10^{-4} using the Trapezoidal Rule.

A) 949 B) 238 C) 92 D) 475

Evaluate the integral by reducing the improper fraction and using a substitution if necessary.

66) $\int \frac{16x^2}{16x^2 + 49}\,dx$ 66) ______

A) $x - \frac{7}{4}\tan^{-1}\left(\frac{x}{7}\right) + C$ B) $x - \frac{7}{8}\ln|16x^2 + 49| + C$

C) $x - \ln|16x^2 + 49| + C$ D) $x - \frac{7}{4}\tan^{-1}\left(\frac{4x}{7}\right) + C$

Solve the problem.

67) Estimate the minimum number of subintervals needed to approximate the integral 67) ______

$\int_0^2 \sqrt{x + 4}\,dx$

with an error of magnitude less than 10^{-4} using Simpson's Rule.

A) 3 B) 4 C) 2 D) 6

Evaluate the integral by reducing the improper fraction and using a substitution if necessary.

68) $\int_1^2 \frac{8x^2 + 10x}{4x - 1}\,dx$ 68) ______

A) $2 + \ln\frac{7}{3}$ B) 6 C) $6 - \frac{3}{4}\ln\frac{7}{3}$ D) $6 + \ln\frac{7}{3}$

Evaluate the integral.

69) $\int_0^{\pi/2} \cos^2 2x \sin^3 2x\,dx$ 69) ______

A) $\frac{4}{5}$ B) $\frac{2}{5}$ C) $\frac{1}{10}$ D) $\frac{1}{5}$

70) $\int \tan^4 9t\,dt$ 70) ______

A) $\frac{\tan^3 9t}{3} - \tan 9t + x + C$ B) $\frac{\tan^3 9t}{27} - \frac{1}{81}\tan^2 9t + \frac{1}{9}\tan 9t + x + C$

C) $\frac{\tan^3 9t}{27} - \frac{1}{9}\tan 9t + x + C$ D) $-\frac{\tan^3 9t}{27} + \frac{1}{9}\tan 9t + C$

Evaluate the integral by multiplying by a form of 1 and using a substitution (if necessary) to reduce it to standard form.

71) $\int \frac{\cos x}{1 - \sin x}\,dx$ 71) ______

A) $\ln|\sec x + \tan x| - \ln|\cos x| + C$ B) $-\ln|\sec x + \tan x| + \ln|\sin x| + C$

C) $\tan x + \sec x + C$ D) $\ln|\sec x + \tan x| + \sec^2 x + C$

Evaluate the integral by first performing long division on the integrand and then writing the proper fraction as a sum of partial fractions.

72) $\int \frac{8x^3 + 8x^2 + 8}{x^2 + x}\,dx$ 72) ______

A) $4x^2 - 8\ln|x + 1| + 8\ln|x| + C$ B) $8\ln|x + 1| - 8\ln|x| + C$

C) $8x^2 + 8\ln|x + 1| - 8\ln|x| + C$ D) $4x^2 + 8\ln|x - 1| - 8\ln|x| + C$

Find the integral.

73) $\int x^2\sqrt{x^3 + 2}\,dx$ 73) ______

A) $\frac{2}{3}(x^3 + 2)^{3/2} + C$
B) $2(x^3 + 2)^{3/2} + C$
C) $\frac{2}{9}(x^3 + 2)^{3/2} + C$
D) $-\frac{2}{3}(x^3 + 2)^{-1/2} + C$

Solve the problem.

74) Find an upper bound for the error in estimating $\int_0^{\pi} 3x \cos x\,dx$ using Simpson's Rule with n = 8 steps. Give your answer as a decimal rounded to five decimal places. 74) ______

A) 0.00498 B) 0.00623 C) 0.00391 D) 0.00889

Express the integrand as a sum of partial fractions and evaluate the integral.

75) $\int \frac{4x^4 + 30x^2 + 50}{x(x^2+5)^2}\,dx$ 75) ______

A) $2 \ln|x| - \frac{4}{x^2 + 5} + C$
B) $7 \ln|x| + \ln|x^2 + 5| + C$
C) $2 \ln|x| + \ln|x^2 + 5| + C$
D) $2 \ln|x| + \ln|x^2 + 5| - \frac{4}{x^2 + 5} + C$

Use Simpson's Rule with n = 4 steps to estimate the integral.

76) $\int_{-1}^{1} (x^2 + 8)\,dx$ 76) ______

A) $\frac{25}{3}$ B) $\frac{50}{3}$ C) $\frac{67}{4}$ D) $\frac{83}{6}$

Use integration by parts to establish a reduction formula for the integral.

77) $\int x^n e^{-ax}\,dx$ 77) ______

A) $\int x^n e^{-ax}\,dx = -\frac{x^n e^{-ax}}{a} + \frac{n}{a}\int x^{n-1} e^{-ax}\,dx$
B) $\int x^n e^{-ax}\,dx = \frac{x^n e^{-ax}}{a} - \frac{n}{a}\int x^{n-1} e^{-ax}\,dx$
C) $\int x^n e^{-ax}\,dx = -\frac{x^n e^{-ax}}{a} + \frac{n}{a}\int x^{n-2} e^{-ax}\,dx$
D) $\int x^n e^{-ax}\,dx = -ax^n e^{-ax} + na\int x^{n-1} e^{-ax}\,dx$

Solve the problem.

78) Suppose that the accompanying table shows the velocity of a car every second for 8 seconds. Use Simpson's Rule to approximate the distance traveled by the car in the 8 seconds. 78) ______

Time (sec)	Velocity (ft/sec)
0	19
1	20
2	21
3	23
4	22
5	24
6	21
7	19
8	20

A) 168.33 feet B) 169.50 feet C) 126.00 feet D) 170.33 feet

79) The length of the ellipse 79) ______
$x = a \cos t,\ y = b \sin t,\ 0 \le t \le 2\pi$
is
$\text{Length} = 4a\int_0^{\pi/2} \sqrt{1 - e^2\cos^2 t}\,dt$
where e is the ellipse's eccentricity.
Use Simpson's Rule with n = 6 to estimate the length of the ellipse when a = 2 and e = 1/3.

A) 12.1751 B) 12.2097 C) 11.8956 D) 11.2546

Evaluate the integral by eliminating the square root.

80) $\int_{-\pi/2}^{\pi/2} \sqrt{\frac{1 + \cos 2x}{2}}\,dx$ 80) ______

A) 0 B) 2 C) 1 D) -2

Evaluate the integral.

81) $\int (1 - 6x)\, e^{(3x - 9x^2)}dx$ 81) ______

A) $3(1 - 6x)e^{(3x - 9x^2)} + C$
B) $\frac{1}{3}(1 - 6x)e^{(3x - 9x^2)} + C$
C) $\frac{1}{3}e^{(3x - 9x^2)} + C$
D) $3e^{(3x - 9x^2)} + C$

Evaluate the improper integral or state that it is divergent.

82) $\int_6^{\infty} \frac{dt}{t^2 - 5t}$ 82) ______

A) $-\frac{1}{5}\ln 6$ B) $5 \ln 6$ C) $\frac{1}{5}\ln 6$ D) $\frac{1}{6}\ln 5$

Solve the initial value problem for y as a function of x.

83) $x\sqrt{x^2 - 36}\,\frac{dy}{dx} = 1,\ x > 6,\ y(12) = 0$ 83) ______

A) $y = \frac{1}{6}\sec^{-1}\frac{x}{6} - \frac{\pi}{18}$
B) $y = \frac{1}{6}\sin^{-1}\frac{x}{6} + \frac{\pi}{18}$
C) $y = \frac{1}{6}\sec^{-1}\frac{x}{6}$
D) $y = \sec^{-1}\frac{x}{6} - \frac{\pi}{3}$

Evaluate the integral.

84) $\int 23x \sin x\,dx$ 84) ______

A) $23 \sin x - x \cos x + C$
B) $23 \sin x - 23 \cos x + C$
C) $23 \sin x - 23x \cos x + C$
D) $23 \sin x + 23x \cos x + C$

85) $\int y^3 e^{-2y}\,dy$ 85) ______

A) $e^{-2y}\left[\frac{1}{2}y^3 - \frac{3}{4}y^2 + \frac{3}{4}y - \frac{3}{8}\right] + C$
B) $-\frac{1}{8}y^4 e^{-2y} + C$
C) $-\frac{1}{2}e^{-2y}\left[y^3 + y^2 + y + 6\right] + C$
D) $-e^{-2y}\left[\frac{1}{2}y^3 + \frac{3}{4}y^2 + \frac{3}{4}y + \frac{3}{8}\right] + C$

Solve the problem.

86) Express $\int \sin^9 x\,dx$ in terms of $\int \sin^7 x\,dx$ 86) ______

A) $\int \sin^9 x\,dx = \frac{1}{9}\sin^8 x \cos x + \frac{8}{9}\int \sin^7 x\,dx$
B) $\int \sin^9 x\,dx = \frac{1}{9}\sin^7 x \cos x + \frac{1}{9}\int \sin^7 x\,dx$
C) $\int \sin^9 x\,dx = \frac{1}{9}\sin^8 x + \frac{8}{9}\int \sin^7 x\,dx$
D) $\int \sin^9 x\,dx = \frac{1}{9}\sin^8 x \cos x + \frac{6}{7}\int \sin^7 x\,dx$

87) Express $\int \cot^{11} x\,dx$ in terms of $\int \cot^9 x\,dx$ 87) ______

A) $\int \cot^{11} x\,dx = -\frac{1}{11}\cot^{10} x \csc x - \int \cot^9 x\,dx$
B) $\int \cot^{11} x\,dx = -\frac{1}{10}\cot^{10} x - \int \cot^9 x\,dx$
C) $\int \cot^{11} x\,dx = -\frac{1}{10}\cot^{10} x + \int \cot^9 x\,dx$
D) $\int \cot^{11} x\,dx = -\frac{1}{10}\cot^{10} x - \frac{1}{10}\int \cot^9 x\,dx$

Evaluate the integral.

88) $\int_0^{\pi/8} \frac{\sec^2 2x}{3 + \tan 2x}\,dx$ 88) ______

A) $\frac{1}{2}\ln\left(\frac{4}{3}\right)$ B) $\frac{4}{3}$ C) $\frac{1}{2}\ln\left(\frac{1}{3}\right)$ D) $\ln\left(\frac{4}{3}\right)$

89) $\int \frac{\sqrt{25 - x^2}}{x}\,dx$ 89) ______

A) $-\sin^{-1}\left(\frac{x}{5}\right) - \frac{\sqrt{25 - x^2}}{x} + C$
B) $\sqrt{25 - x^2} - \sin^{-1}\left(\frac{x}{5}\right) + C$
C) $\sqrt{25 - x^2} + 5 \ln\left|\frac{5 + \sqrt{25 - x^2}}{x^2}\right| + C$
D) $\sqrt{25 - x^2} - 5 \ln\left|\frac{5 + \sqrt{25 - x^2}}{x}\right| + C$

Solve the problem.

90) Find the volume of the solid generated by revolving the region in the first quadrant bounded by $y = e^x$ and the x-axis, from x = 0 to x = ln 7, about the y-axis. 90) ______

A) $7\pi \ln 7$ B) $2\pi(7\ln 7 - 6)$ C) $14\pi \ln 7$ D) $2\pi(7\ln 7 - 7)$

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

91) $\int_{\pi/8}^{\pi/4} \csc^2 2\theta\,d\theta$ 91) ______

θ	csc² 2θ
0.39270	2
0.44179	1.67351
0.49087	1.44646
0.53996	1.28570
0.58905	1.17157
0.63814	1.09202
0.68722	1.03957
0.73631	1.00970
0.78540	1

A) T = 0.50160; E_T = −0.00160
B) T = 0.52614; E_T = −0.02614
C) T = 0.57523; E_T = −0.07523
D) T = 0.50002; E_T = −0.00002

Integrate the function.

92) $\int \frac{(4 - x^2)^{1/2}}{x^4}\,dx,\ x < 2$ 92) ______

A) $-\frac{12x^3}{(4 - x^2)^{3/2}} + C$
B) $\frac{4}{(4 - x^2)^{1/2}} + C$
C) $\frac{(4 - x^2)^{3/2}}{x^3} + C$
D) $-\frac{(4 - x^2)^{3/2}}{12x^3} + C$

Evaluate the integral by using a substitution prior to integration by parts.

93) $\int \ln(3x + 3x^2)\,dx$ 93) ______

A) $\ln(3x + 3x^2) - 2x + C$
B) $\ln(3x + 3x^2) + \ln(x + 1) + C$
C) $x\ln(3x + 3x^2) + \ln(x + 1) - 2x + C$
D) $x\ln(3x + 3x^2) + C$

Evaluate the integral by eliminating the square root.

94) $\int_{\pi/6}^{\pi/2} \sqrt{36\csc^2 t - 36}\,dt$ 94) ______

Give your answer in exact form.

A) ln 2 B) 6 ln 2 C) 6 D) 6 ln 0.5

Determine whether the improper integral converges or diverges.

95) $\int_1^{\infty} \frac{1}{x^6 + 2} dx$ 95) ______

A) Converges B) Diverges

Evaluate the integral by using trigonometric identities and substitutions to reduce it to standard form.

96) $\int \sin 2x \sec x\,dx$ 96) ______

A) $-2\cos x + C$ B) $\cos x + C$ C) $2\sin x + C$ D) $-\cos x + C$

Solve the problem.

97) Find the volume of the solid generated by revolving the region bounded by the curves $y = \sec^2 x$ and $y = \tan^2 x$, $0 \le x \le \frac{\pi}{5}$, about the x-axis. 97) ______

A) $5\pi^3$ B) $\frac{\pi^3}{5}$ C) π D) $\frac{\pi^2}{5}$

Evaluate the integral.

98) $\int \frac{dx}{1 + (5x + 6)^2}$ 98) ______

A) $\frac{1}{5}\sin^{-1}(5x + 6) + C$
B) $\tan^{-1}(5x + 6) + C$
C) $\frac{1}{5}\tan^{-1}(x + 6) + C$
D) $\frac{1}{5}\tan^{-1}(5x + 6) + C$

Use your calculator to approximate the integral using the method indicated.

99) Simpson's Rule, $\int_0^3 \left(4 + \frac{1}{x + 3}\right) dx$, n = 100 99) ______

A) 12.657 B) 12.7823 C) 12.6768 D) 12.6931

100) Simpson's Rule, $\int_0^3 \sqrt{x + 4}\,dx$, n = 100 100) ______

A) 6.9758 B) 7.1088 C) 7.0135 D) 7.0292

Determine whether the improper integral converges or diverges.

101) $\int_0^2 \frac{dx}{|x - 1|} dx$ 101) ______

A) Converges B) Diverges

Solve the initial value problem for y as a function of x.

102) $\sqrt{x^2 - 81}\frac{dy}{dx} = x$, $x > 9$, $y(18) = 0$ 102) ______

A) $y = \frac{\sqrt{x^2 - 81}}{x}$
B) $y = \sqrt{x^2 - 81}$
C) $y = \sqrt{x^2 - 81} - 9\sqrt{3}$
D) $y = \frac{\sqrt{x^2 - 81}}{x} - \frac{\sqrt{3}}{2}$

Solve the problem.

103) Estimate the minimum number of subintervals needed to approximate the integral 103) ______

$\int_{-\pi/2}^{\pi/2} 4\sin x\,dx$

with an error of magnitude less than 10^{-4} using the Trapezoidal Rule.

A) 58 B) 322 C) 228 D) 114

Evaluate the integral.

104) $\int \cot^4 8t\,dt$ 104) ______

A) $-\frac{\cot^3 8x}{24} + \frac{\cot^2 8x}{8} + x + C$
B) $-\frac{\cot^3 8x}{24} + \frac{\cot 8x}{8} + x + C$
C) $-\frac{\cot^3 5x}{15} + \frac{\cot 5x}{5} + C$
D) $-\frac{\cot^3 8x}{3} + \cot 8x + x + C$

Use Simpson's Rule with n = 4 steps to estimate the integral.

105) $\int_0^3 x\,dx$ 105) ______

A) 9 B) $\frac{9}{4}$ C) $\frac{15}{4}$ D) $\frac{9}{2}$

Determine whether the improper integral converges or diverges.

106) $\int_1^{\infty} \frac{e^x}{\sqrt{1 + x^2}} dx$ 106) ______

A) Diverges B) Converges

Solve the problem.

107) An oil storage tank can be described as the volume generated by revolving the area bounded by $y = \frac{12.0}{\sqrt{36.0 + x^2}}$, $x = 0$, $y = 0$, $x = 3$ about the x-axis. Find the volume (in m^3) of the tank. 107) ______

A) 35.0 m^3 B) 17.5 m^3 C) 1.46 m^3 D) 237 m^3

Evaluate the integral.

108) $\int (3x + 2)e^{-4x}\,dx$ 108) ______

A) $\frac{3}{4}x e^{-4x} + \frac{11}{16}e^{-4x} + C$
B) $-\frac{3}{4}x e^{-4x} - e^{-4x} + C$
C) $-\frac{3}{4}x e^{-4x} - \frac{11}{16}e^{-4x} + C$
D) $-12x e^{-4x} - 56 e^{-4x} + C$

109) $\int_{\pi/12}^{\pi/2} (1 - \cos 4x)\cos 2x\,dx$ 109) ______

A) $-\frac{1}{24}$ B) $\frac{13}{48}$ C) $\frac{13}{24}$ D) $-\frac{11}{24}$

110) $\int \sqrt{16 - x^2}\,dx$ 110) ______

A) $\frac{x}{2}\sqrt{16 - x^2} + 8\sin^{-1}\frac{x}{4} + C$
B) $\frac{x}{2}\sqrt{16 - x^2} - 8\ln\left|x + \sqrt{16 - x^2}\right| + C$
C) $\frac{x}{2}\sqrt{16 - x^2} + 8\sin^{-1}\frac{x}{16} + C$
D) $\sin^{-1}\frac{x}{4} + C$

Find the surface area or volume.

111) Use an integral table and a calculator to find to two decimal places the area of the surface generated by revolving the curve $y = x^2/2$, $0 \le x \le 3$, about the x-axis. 111) ______

A) 57.10 B) 70.07 C) 80.29 D) 98.14

Solve the initial value problem for x as a function of t.

112) $(t + 2)\frac{dx}{dt} = x^2 + 1$, $t > -2$, $x(2) = \tan 1$ 112) ______

A) $x = \tan^{-1}[\ln|t + 2| - \ln 4 + 1]$
B) $x = \tan[\ln|t + 2| - \ln 4 + 1]$
C) $x = \tan[\ln|t + 2| - \ln 4]$
D) $x = \frac{1}{t + 2} - \frac{1}{t - 4}$

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

113) $\int_{-\pi}^{0} \sin x\,dx$ 113) ______

A) $-\frac{1 + \sqrt{2}}{8}\pi$ B) $-\frac{1 + \sqrt{2}}{2}\pi$ C) $-(1 + \sqrt{2})\pi$ D) $-\frac{1 + \sqrt{2}}{4}\pi$

Evaluate the integral.

114) $\int_2^4 6x\ln x\,dx$ 114) ______

A) 9.48 B) 6.70 C) 40.2 D) 55.2

Express the integrand as a sum of partial fractions and evaluate the integral.

115) $\int \frac{3x^2 - 27x + 30}{x^3 - 8x^2 + 15x} dx$ 115) ______

A) $-3\ln|x - 5| + 4\ln|x - 3| + C$
B) $\ln|x| - \ln|x - 5| + \ln|x - 3| + C$
C) $2\ln|x| + 4\ln|x - 5| - 3\ln|x - 3| + C$
D) $2\ln|x| - 3\ln|x - 5| + 4\ln|x - 3| + C$

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

116) $\int_1^3 \frac{8}{x^2} dx$ 116) ______

A) $\frac{141}{50}$ B) $\frac{141}{25}$ C) $\frac{282}{25}$ D) $\frac{142}{25}$

Evaluate the integral.

117) $\int \sin^5 x \cos x\,dx$ 117) ______

A) $\frac{\sin^5 x}{6} + C$ B) $\frac{\sin^5 x}{5} + C$ C) $\frac{\sin^6 x}{5} + C$ D) $\frac{\sin^6 x}{6} + C$

Integrate the function.

118) $\int_0^5 \frac{64\,dx}{(64 - x^2)^{3/2}}$ 118) ______

A) $\frac{5\sqrt{39}}{39}$ B) $\sqrt{39} - 39$ C) $39^{3/2}$ D) $\frac{\sqrt{39}}{39}$

Evaluate the integral.

119) $\int \frac{\sinh^4\sqrt{x}}{\sqrt{x}} dx$ 119) ______

A) $\frac{1}{2}\sinh^3\sqrt{x}\cosh\sqrt{x} + \frac{3}{8}x\sinh\sqrt{x} - \frac{3}{4}\sqrt{x} + C$
B) $\frac{1}{2}\sinh^3 x\cosh x - \frac{3}{8}\sinh 2x + \frac{3}{4}x + C$
C) $\frac{1}{\sqrt{x}}\left[\frac{1}{2}\sinh^3\sqrt{x}\cosh\sqrt{x} - \frac{3}{8}\sinh 2\sqrt{x} + \frac{3}{4}\sqrt{x}\right] + C$
D) $\frac{1}{2}\sinh^3\sqrt{x}\cosh\sqrt{x} - \frac{3}{8}\sinh 2\sqrt{x} + \frac{3}{4}\sqrt{x} + C$

Evaluate the improper integral.

120) $\int_0^3 x\ln 6x\,dx$ 120) ______

A) $\frac{9}{2}\ln 6 - \frac{9}{4}$ B) $\frac{9}{2}\ln 18 - \frac{9}{4}$ C) $-\frac{1}{2}\ln 18 + \frac{9}{4}$ D) $\frac{9}{2}\ln 18 - \frac{9}{2}$

Evaluate the integral by making a substitution and then using a table of integrals.

121) $\int \frac{dx}{x(25 + (\ln x)^2)}$ 121) ______

A) $\frac{1}{5}\tan^{-1}\left(\frac{x}{5}\right) + C$
B) $\frac{1}{5}\tan^{-1}\left(\frac{\ln x}{5}\right) + C$
C) $\frac{1}{5}\sin^{-1}\left(\frac{\ln x}{5}\right) + C$
D) $\frac{1}{5}\sin^{-1}\left(\frac{x}{5}\right) + C$

Evaluate the integral.

122) $\int \frac{4^{\sqrt{w}}}{2\sqrt{w}}\, dw$ 122) ______

A) $\frac{4^{\sqrt{w}}}{\ln 4\sqrt{w}} + C$
B) $4^{\sqrt{w}} + C$
C) $\frac{4^{\sqrt{w}}}{\ln 4} + C$
D) $\frac{4^{\sqrt{w}}}{2 \ln 4} + C$

Evaluate the integral by first performing long division on the integrand and then writing the proper fraction as a sum of partial fractions.

123) $\int \frac{x^4}{x^2 - 25} dx$ 123) ______

A) $\frac{x^3}{3} + 25x + \frac{125}{2} \ln|x - 5| - \frac{125}{2} \ln|x + 5| + C$
B) $\frac{x^3}{3} + 25x + \frac{125}{2} \ln|x - 25| - \frac{125}{2} \ln|x + 25| + C$
C) $\frac{x^3}{3} + \frac{25}{2} \ln|x - 5| - \frac{25}{2} \ln|x + 5| + C$
D) $\frac{x^3}{3} + 25x - \frac{125}{2} \ln|x - 5| + \frac{125}{2} \ln|x + 5| + C$

Solve the problem.

124) Estimate the minimum number of subintervals needed to approximate the integral 124) ______

$\int_0^5 (3x + 8)dx$

with an error of magnitude less than 10^{-4} using the Trapezoidal Rule.

A) 0
B) 3
C) 2
D) 1

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

125) $\int_0^5 x\, dx$ 125) ______

A) 25
B) $\frac{125}{8}$
C) $\frac{25}{2}$
D) $\frac{25}{4}$

Evaluate the integral.

126) $\int \frac{\sqrt{3x - 7}}{x^2} dx$ 126) ______

A) $-\frac{\sqrt{3x - 7}}{x} + \frac{3\sqrt{7}}{7}\ln\left|\frac{\sqrt{3x - 7} - \sqrt{7}}{\sqrt{3x - 7} + \sqrt{7}}\right| + C$
B) $-\frac{\sqrt{3x - 7}}{x} + \frac{3\sqrt{7}}{7}\tan^{-1}\left(\frac{\sqrt{3x - 7}}{x^2}\right) + C$
C) $\frac{\sqrt{3x - 7}}{x} + 3\tan^{-1}\sqrt{\frac{3x - 7}{7}} + C$
D) $-\frac{\sqrt{3x - 7}}{x} + \frac{3\sqrt{7}}{7}\tan^{-1}\sqrt{\frac{3x - 7}{7}} + C$

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

127) $\int_1^2 (1 - 2t)^3\, dt$ 127) ______

t	$(1 - 2t)^3$
1	−1
1.125	−1.95313
1.25	−3.375
1.375	−5.35938
1.5	−8
1.625	−11.39063
1.75	−15.625
1.875	−20.79688
2	−27

A) $T = -20.12501$; $E_T = 0.12501$
B) $T = -10.06250$; $E_T = 0.06250$
C) $T = -10.125$; $E_T = 0.125$
D) $T = -11.75$; $E_T = 1.75$

Use integration by parts to establish a reduction formula for the integral.

128) $\int x^n e^{-x^2} dx$ 128) ______

A) $\int x^n e^{-x^2} dx = -\frac{1}{2}x^{n-1} e^{-x^2} + \frac{n-1}{2}\int x^{n-2} e^{-x^2} dx$
B) $\int x^n e^{-x^2} dx = -2x^{n-1} e^{-x^2} - 2(n-1)\int x^{n-2} e^{-x^2} dx$
C) $\int x^n e^{-x^2} dx = -\frac{1}{2}x^n e^{-x^2} + \frac{n}{2}\int x^{n-1} e^{-x^2} dx$
D) $\int x^n e^{-x^2} dx = n x^{n-1} e^{-x^2} + 2n\int x^{n-1} e^{-x^2} dx$

Evaluate the integral.

129) $\int x \csc^2 3x\, dx$ 129) ______

A) $-x \cot 3x + \ln|\sin 3x| + C$
B) $\frac{1}{3} x \cot 3x - \frac{1}{9} \ln|\sin 3x| + C$
C) $-3x \cot 3x + 9 \ln|\sin 3x| + C$
D) $-\frac{1}{3} x \cot 3x + \frac{1}{9} \ln|\sin 3x| + C$

Provide the proper response.

130) When we use Simpson's rule to approximate a definite integral, it is necessary that the number of partitions be _?_. 130) ______

A) a multiple of 4
B) an odd number
C) an even number
D) either an even or odd number

Evaluate the improper integral or state that it is divergent.

131) $\int_{-\infty}^{\infty} x^3 e^{-x^4} dx$ 131) ______

A) $\frac{1}{4}$
B) $-\frac{1}{2}$
C) 0
D) Divergent

Evaluate the integral.

132) $\int_{\pi/20}^{\pi/10} \cot^4 5t\, dt$ 132) ______

A) $-\frac{2}{15}$
B) $\frac{\pi}{20} - \frac{2}{15}$
C) $\frac{\pi}{10} - \frac{2}{15}$
D) $\frac{\pi}{20} - \frac{2}{3}$

Solve the problem.

133) Find an upper bound for the error in estimating $\int_1^3 (9x^2 + 9)dx$ using the Trapezoidal Rule with n = 4 steps. 133) ______

A) $\frac{81}{32}$
B) $\frac{3}{8}$
C) $\frac{3}{4}$
D) $\frac{1}{24}$

Solve the problem by integration.

134) By a computer analysis, the electric current i (in A) in a certain circuit is given by $i = \frac{0.0050(4t^2 + 4t + 30)}{(t + 2)(t^2 + 15)}$, where t is the time (in s). Find the total charge that passes a point in the circuit in the first 0.250 s. 134) ______

A) 0.0059 C
B) 0.0006 C
C) 0.0012 C
D) 0.0061 C

Evaluate the integral.

135) $\int x \sinh 9x\, dx$ 135) ______

A) $\frac{x}{9} \sinh 9x - \frac{1}{81} \cosh 9x + C$
B) $\frac{1}{9} \cosh 9x - \frac{1}{81} \sinh 9x + C$
C) $\frac{x}{9} \cosh 9x + \frac{1}{81} \sinh 9x + C$
D) $\frac{x}{9} \cosh 9x - \frac{1}{81} \sinh 9x + C$

Solve the problem.

136) Find the area between $y = (x - 4)e^x$ and the x-axis from x = 4 to x = 9. 136) ______

A) $4e^9 + e^4$
B) $e^9 - e^4$
C) $4e^9$
D) $e^9 + e^4$

Evaluate the integral.

137) $\int \tan^5 3x\, dx$ 137) ______

A) $\frac{1}{4}\tan^4 3x - \frac{1}{2}\tan^2 3x - \ln|\cos x| + C$
B) $\frac{1}{12}\tan^4 3x - \frac{1}{6}\tan^2 3x - \frac{1}{3}\ln|\cos x| + C$
C) $-\frac{1}{12}\tan^4 3x + \frac{1}{6}\tan^2 3x - \frac{1}{3}\ln|\cos x| + C$
D) $\frac{1}{12}\tan^4 3x - \frac{1}{6}\tan^2 3x + \frac{1}{3}\ln|\cos x| + C$

138) $\int \frac{dx}{x\sqrt{36 + \ln^2 x}}$ 138) ______

A) $\cosh^{-1}\left(\frac{\ln x}{6}\right) + C$
B) $\tan^{-1}\left(\frac{\ln x}{6}\right) + C$
C) $\sin^{-1}\left(\frac{\ln x}{6}\right) + C$
D) $\sinh^{-1}\left(\frac{\ln x}{6}\right) + C$

Expand the quotient by partial fractions.

139) $\frac{6x + 6}{x^2 - 10x + 24}$ 139) ______

A) $\frac{21}{x - 6} + \frac{15}{x - 4}$
B) $\frac{21}{x - 6} - \frac{15}{x - 4}$
C) $\frac{21}{x - 6} - \frac{15}{(x - 6)(x - 4)}$
D) $\frac{42}{x - 6} + \frac{30}{x - 4}$

Use your calculator to approximate the integral using the method indicated.

140) Simpson's Rule, $\int_0^3 e^x\, dx$, n = 100 140) ______

A) 18.9928
B) 19.0855
C) 19.087
D) 20.0855

Evaluate the integral by using a substitution prior to integration by parts.

141) $\int \frac{1}{2}e^{\sqrt{6x + 3}}\, dx$ 141) ______

A) $\frac{1}{6} e^{\sqrt{6x + 3}} [\sqrt{6x + 3} - 6] + C$
B) $\frac{\sqrt{6x + 3}}{6} e^{\sqrt{6x + 3}} + C$
C) $(6x + 3) e^{\sqrt{6x + 3}} + C$
D) $\frac{1}{6} e^{\sqrt{6x + 3}} [\sqrt{6x + 3} - 1] + C$

Evaluate the improper integral or state that it is divergent.

142) $\int_{-\infty}^{0} \frac{dx}{(81 + x)\sqrt{x}}$ 142) ______

A) $-\frac{\pi}{9}$
B) -9π
C) 0
D) $\frac{\pi}{9}$

143) $\int_{-\infty}^{-3} \frac{6}{x^3} dx$ 143) ______

A) $-\frac{1}{3}$
B) $-\frac{1}{243}$
C) Divergent
D) $\frac{2}{3}$

Evaluate the integral by making a substitution and then using a table of integrals.

144) $\displaystyle\int \frac{e^{2x}}{3e^x + 5}\,dx$ 144) _____

A) $\frac{5}{3e^x+5} + \ln|3e^x + 5| + C$ B) $\frac{e^x}{3} - \frac{5}{9}\ln|3e^x + 5| + C$

C) $\frac{x}{3} - \frac{5}{9}\ln|3x + 5| + C$ D) $\frac{e^x}{3} + \frac{5}{9}\sin^{-1}|3e^x + 5| + C$

Evaluate the integral by multiplying by a form of 1 and using a substitution (if necessary) to reduce it to standard form.

145) $\displaystyle\int \frac{1}{5 + 5\csc x}\,dx$ 145) _____

A) $\frac{1}{5}(\tan x - \sec x - x) + C$ B) $-\frac{1}{5}(\tan x - \sec x - x) + C$

C) $-\frac{1}{5}(\tan^2 x - \sec x \tan x) + C$ D) $\tan x + \sec x - x + C$

Use a trigonometric substitution to evaluate the integral.

146) $\displaystyle\int_0^{\ln 3} \frac{e^t\,dt}{25 + e^{2t}}$ 146) _____

A) −0.069 B) 0.069 C) 0.343 D) 0.043

Evaluate the integral by eliminating the square root.

147) $\displaystyle\int_\pi^{2\pi} \sqrt{36 - 36\cos^2\theta}\,d\theta$ 147) _____

A) 12 B) 6 C) −12 D) 3

Solve the problem.

148) A rectangular swimming pool is being constructed, 18 feet long and 100 feet wide. The depth of the pool is measured at 3-foot intervals across the width of the pool. Estimate the volume of water in the pool using the Simpson's Rule. 148) _____

Width (ft)	Depth (ft)
0	5
3	5.5
6	6
9	7
12	7.5
15	8
18	9

A) 14,400 ft^3 B) 12,300 ft^3 C) 8200 ft^3 D) 10,900 ft^3

Solve the problem by integration.

149) Under specified conditions, the time t (in min) required to form x grams of a substance during a chemical reaction is given by $t = \displaystyle\int \frac{dx}{(7 - x)(2 - x)}$. Find the equation relating t and x if x = 0 g when t = 0 min. 149) _____

A) $t = \frac{1}{5}\ln\left|\frac{7 - x}{2 - x}\right| + \frac{1}{5}\ln\frac{7}{2}$ B) $t = \frac{1}{5}\ln\left|\frac{7 - x}{2 - x}\right| - \frac{1}{5}\ln\frac{7}{2}$

C) $t = \frac{1}{5}\ln\left|\frac{2 - x}{7 - x}\right| - \frac{1}{5}\ln\frac{2}{7}$ D) $t = \frac{1}{5}\ln\left|\frac{2 - x}{7 - x}\right| + \frac{1}{5}\ln\frac{2}{7}$

Evaluate the integral.

150) $\displaystyle\int_0^{\pi/2} \sin 10t \sin 9t\,dt$ 150) _____

A) $\frac{1}{2}$ B) $\frac{20}{39}$ C) $\frac{11}{19}$ D) $\frac{10}{19}$

Provide the proper response.

151) The "trapezoidal" sum can be calculated in terms of the left and right-hand sums as _?_. 151) _____

A) left-hand sum + right-hand sum B) left-hand sum − right-hand sum

C) $\frac{\text{left-hand sum + right-hand sum}}{2}$ D) None of the above is correct.

Integrate the function.

152) $\displaystyle\int \frac{3\,dx}{\sqrt{5 + x^2}}$ 152) _____

A) $\frac{2}{x^2 + 5} + C$ B) $3\ln\left|x + \sqrt{5 + x^2}\right| + C$

C) $x + \ln\left|3 + \sqrt{5 + x^2}\right| + C$ D) $3\ln\left|\sqrt{5 + x^2}\right| + C$

Evaluate the integral by eliminating the square root.

153) $\displaystyle\int_0^{\pi/2} \sqrt{9 - 9\sin^2\theta}\,d\theta$ 153) _____

A) 3 B) $\frac{3}{2}$ C) 9 D) −3

Evaluate the integral.

154) $\displaystyle\int \frac{(-\sin t - 7)\cos t\,dt}{\sin^3 t + 2\sin^2 t + \sin t + 2}$ 154) _____

A) $-\ln|\sin t + 2| + \frac{1}{2}\ln|\sin^2 t + 1| - 3\tan^{-1}(\sin t) + C$

B) $-\ln|\sin t + 2| + \frac{1}{2}\ln|\sin^2 t + 1| + C$

C) $-\ln|t + 2| + \frac{1}{2}\ln|t^2 + 1| - 3\tan^{-1} t + C$

D) $\ln|\sin t + 2| - \ln|\sin^2 t + 1| - 5\tan^{-1}(\sin t) + C$

Solve the problem.

155) Estimate the area of the surface generated by revolving the curve $y = 2x^2$, $0 \le x \le 3$ about the x-axis. Use Simpson's Rule with n = 6. 155) _____

A) 996.028 B) 1021.107 C) 1007.254 D) 1024.885

Evaluate the integral.

156) $\displaystyle\int (x^2 - 3x)e^x\,dx$ 156) _____

A) $e^x[x^2 - 5x - 5] + C$ B) $\frac{1}{3}x^3e^x - \frac{3}{2}x^2e^x + C$

C) $e^x[x^2 - 5x + 5] + C$ D) $e^x[x^2 - 3x + 3] + C$

Use the substitution z = tan (x/2) to evaluate the integral.

157) $\displaystyle\int \frac{dx}{1 + \cos x}$ 157) _____

A) $\sqrt{2}\tan\frac{x}{2} + C$ B) $\frac{\sqrt{2}}{2}\ln\left|\frac{\tan\frac{x}{2} + \sqrt{2}}{\tan\frac{x}{2} - \sqrt{2}}\right| + C$

C) $2\tan\frac{x}{2} + C$ D) $\tan\frac{x}{2} + C$

Evaluate the integral.

158) $\displaystyle\int x^2 \sinh 2x\,dx$ 158) _____

A) $\frac{x^2}{2}\cosh 2x - \frac{1}{2}x\sinh 2x - \frac{1}{4}\cosh 2x + C$

B) $\frac{x^2}{2}\cosh 2x - \frac{1}{2}x\sinh 2x - \frac{1}{2}\cosh 2x + C$

C) $\frac{x^2}{2}\sinh 2x - \frac{1}{2}x^2\cosh 2x + \frac{1}{4}x\sinh 2x + C$

D) $\frac{x^2}{2}\cosh 2x - \frac{1}{2}x\sinh 2x + \frac{1}{4}\cosh 2x + C$

Evaluate the integral by using trigonometric identities and substitutions to reduce it to standard form.

159) $\displaystyle\int 2\sin^2 x\,dx$ 159) _____

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

Evaluate the integral by first performing long division on the integrand and then writing the proper fraction as a sum of partial fractions.

160) $\displaystyle\int \frac{3x^3 + 11x^2 - 2x - 4}{x^3 - x^2}\,dx$ 160) _____

A) $\frac{3}{x} + 6\ln|x| - \frac{4}{x^2} + 8\ln|x - 1| + C$ B) $3x + 6\ln|x^2| - \frac{4}{x^2} + 8\ln|x - 1| + C$

C) $3x + 6\ln|x| - \frac{4}{x} + 8\ln|x - 1| + C$ D) $3x + 7\ln|x| + \frac{4}{x} + 8\ln|x - 1| + C$

Find the surface area or volume.

161) Use numerical integration with a programmable calculator or a CAS to find, to two decimal places, the area of the surface generated by revolving the curve $y = \cos x$, $0 \le x \le \frac{\pi}{2}$, about the x-axis. 161) _____

A) 1.15 B) 7.21 C) 2.29 D) 14.42

Evaluate the improper integral or state that it is divergent.

162) $\displaystyle\int_{-\infty}^{0} 16\,e^x \sin x\,dx$ 162) _____

A) 0 B) − 8 C) −16 D) 8

163) $\displaystyle\int_6^\infty \frac{dx}{x^2 - 25}$ 163) _____

A) $\frac{1}{10}\ln\frac{1}{6}$ B) $\frac{1}{10}\ln 11$ C) $-\frac{1}{5}\ln 11$ D) $\frac{1}{10}\ln 6$

Evaluate the integral.

164) $\displaystyle\int 3\cos^4 6x\,dx$ 164) _____

A) $\frac{1}{8}\cos^2 6x\sin 6x + \frac{1}{8}x + \frac{3}{16}\sin 12x + C$ B) $\frac{1}{8}\cos^3 6x\sin 6x + \frac{3}{32}\sin 12x + C$

C) $\frac{1}{4}\cos^3 6x\sin 6x + \frac{1}{8}x + \frac{3}{32}\sin 6x + C$ D) $\frac{1}{8}\cos^3 6x\sin 6x + \frac{9}{8}x + \frac{3}{32}\sin 12x + C$

Solve the problem.

165) Find the volume of the solid generated by revolving the region in the first quadrant bounded by the coordinate axes, the curve $y = e^x$, and the line x = ln 6 about the line x = ln 6. 165) _____

A) $2\pi(5 + \ln 6)$ B) $2\pi(5 - \ln 6)$ C) $2\pi(6 - \ln 6)$ D) $2\pi(6 - \ln 7)$

Evaluate the integral.

166) $\int \sin 7x \cos 5x \, dx$ 166) ______

A) $-\frac{\cos 2x}{4} - \frac{\cos 12x}{24} + C$ B) $-\frac{\cos 2x}{4} + \frac{\cos 14x}{12} + C$

C) $\frac{\sin 2x}{4} - \frac{\sin 7x}{24} + C$ D) $\frac{\sin 2x}{4} + \frac{\sin 12x}{24} + C$

Evaluate the improper integral or state that it is divergent.

167) $\int_1^{\infty} \frac{1}{x(x^2+9)} dx$ 167) ______

A) ln 10 B) ln 8 C) $\frac{\ln 10}{18}$ D) Divergent

Evaluate the integral.

168) $\int 4xe^x \, dx$ 168) ______

A) $4xe^x - 4e^x + C$ B) $4e^x - 4xe^x + C$ C) $xe^x - 4e^x + C$ D) $4e^x - e^x + C$

Determine whether the improper integral converges or diverges.

169) $\int_6^{\infty} \frac{dx}{x^{5/4}}$ 169) ______

A) Diverges B) Converges

Evaluate the integral.

170) $\int_1^3 \ln 8x \, dx$ 170) ______

A) 24.2 B) 5.45 C) 9.45 D) −8.55

Use a trigonometric substitution to evaluate the integral.

171) $\int_0^1 \frac{e^x \, dx}{49 - e^{2x}}$ 171) ______

A) 0.033 B) 0.229 C) 0.038 D) 0.532

Evaluate the integral.

172) $\int xe^{-4x} \, dx$ 172) ______

A) $\frac{xe^{-4x}}{-4} + \frac{e^{-4x}}{4} + C$ B) $xe^{-4x} + \frac{e^{-4x}}{4} + C$

C) $-\frac{xe^{-4x}}{4} - \frac{e^{-4x}}{16} + C$ D) $-\frac{xe^{-4x}}{4} + \frac{e^{-4x}}{16} + C$

Provide the proper response.

173) The "Simpson" sum is based upon the area under a _?_. 173) ______

A) parabola B) rectangle C) trapezoid D) triangle

Evaluate the integral.

174) $\int \csc^4\left(\frac{t}{5}\right) dt$ 174) ______

A) $-\frac{5}{3}\csc^2\left(\frac{t}{5}\right)\cot\left(\frac{t}{5}\right) - \frac{10}{3}\cot\left(\frac{t}{5}\right) + C$ B) $-\frac{5}{3}\csc^3\left(\frac{t}{5}\right)\cot\left(\frac{t}{5}\right) + \frac{10}{3}\cot\left(\frac{t}{5}\right) + C$

C) $-\frac{1}{15}\csc^2\left(\frac{t}{5}\right)\cot\left(\frac{t}{5}\right) - \frac{2}{15}\cot\left(\frac{t}{5}\right) + C$ D) $-\frac{5}{3}\csc^2\left(\frac{t}{5}\right)\cot\left(\frac{t}{5}\right) - \frac{10}{3}\csc\left(\frac{t}{5}\right) + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

175) $\int \frac{x^3}{x^2 + 1x + 1} dx$ 175) ______

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

C) $48\ln|x - 16| + \frac{48}{x+4} - \frac{64}{(x+4)^2} + C$ D) $\frac{x^2}{2} - 1x - 3\ln|x+1| + \frac{1}{(x+1)^2} + C$

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

176) $\int_0^{\pi} \frac{\sin t}{(2 - \cos t)^2} dt$ 176) ______

t	$\sin t/(2 - \cos t)^2$
0	0
0.39270	0.33046
0.78540	0.42302
1.17810	0.35320
1.57080	0.25
1.96350	0.16273
2.35619	0.09649
2.74889	0.04476
3.14159	0

A) $T = 0.66806$; $E_T = -0.00140$ B) $T = 0.63622$; $E_T = 0.03045$

C) $T = 0.65214$; $E_T = 0.01453$ D) $T = 0.57847$; $E_T = 0.08820$

Solve the problem by integration.

177) Find the volume generated by revolving the first-quadrant area bounded by $y = \frac{15}{x^4 + 9x^2 + 18}$ and $x = 2$ about the y-axis. 177) ______

A) $10\pi \ln \frac{7}{5}$ B) $5\pi \ln \frac{7}{5}$ C) $\frac{5}{2}\pi \ln 1260$ D) $5\pi \ln 1260$

Evaluate the integral.

178) $\int \sec 6t \, dt$ 178) ______

A) $\frac{1}{6}\ln|\sec 6t - \tan 6t| + C$ B) $\frac{1}{6}\ln|\sec 6t + \tan 6t| + C$

C) $\frac{1}{12}\ln|\sec 6t - \cot 6t| + C$ D) $\ln|\sec 6t + \tan 6t| + C$

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

179) $\int_1^3 (12x + 3) \, dx$ 179) ______

A) 54 B) 108 C) 27 D) $\frac{135}{4}$

Evaluate the integral.

180) $\int \frac{dx}{x^2 + 6x + 18}$ 180) ______

A) $\frac{1}{3}\tan^{-1}\left(\frac{x+3}{3}\right) + C$ B) $\frac{1}{3}\sin^{-1}\left(\frac{x+3}{3}\right) + C$

C) $(2x+6)\ln|x^2 + 6x + 18| + C$ D) $3\tan^{-1}\left(\frac{x+3}{3}\right) + C$

181) $\int \frac{dx}{\sqrt{1 - 16x^2}}$ 181) ______

A) $4\sin^{-1} 4x + C$ B) $\frac{1}{4}\sec^{-1} 4x + C$

C) $\frac{1}{4}\sin^{-1} 4x + C$ D) $\frac{1}{16}\sin^{-1} 16x + C$

Solve the problem.

182) Estimate the minimum number of subintervals needed to approximate the integral 182) ______

$\int_2^6 \frac{1}{x-1} dx$

with an error of magnitude less than 10^{-4} using Simpson's Rule.

A) 6 B) 36 C) 1170 D) 70

Integrate the function.

183) $\int \frac{\sqrt{x^2 - 4}}{x} dx$ 183) ______

A) $2\ln\left|\sqrt{x^2-4} - \left(\frac{x}{2}\right)\right| + C$ B) $2\left[\frac{\sqrt{x^2-4}}{2} - \sec^{-1}\left(\frac{x}{2}\right)\right] + C$

C) $2\left[\frac{\sqrt{x^2-4}}{2} - \sin^{-1}\left(\frac{x}{2}\right)\right] + C$ D) $\left[\frac{\sqrt{x^2-4}}{4} - \sec^{-1}\left(\frac{x}{2}\right)\right] + C$

Find the integral.

184) $\int \frac{dx}{\sqrt{x}(\sqrt{x} - 7)}$ 184) ______

A) $2\ln|\sqrt{x} - 7| + C$ B) $4\sqrt{x}(\sqrt{x} - 7) + C$ C) $\frac{2\ln|\sqrt{x} - 7|}{\sqrt{x}} + C$ D) $\ln|\sqrt{x} - 7| + C$

Evaluate the integral.

185) $\int \cosh(5x + \ln 5) \, dx$ 185) ______

A) $(5 + \ln 5)\sinh(5x + \ln 5) + C$ B) $\frac{1}{5}\sinh(5x + \ln 5) + C$

C) $\frac{1}{5}\sin(5x + \ln 5) + C$ D) $\frac{1}{5 + \ln 5}\sinh(5x + \ln 5) + C$

Evaluate the integral by using trigonometric identities and substitutions to reduce it to standard form.

186) $\int 2\cot 2x \cos x \, dx$ 186) ______

A) $-\ln|\csc x + \cot x| + \cos x + C$ B) $\ln|\csc x + \cot x| + C$

C) $-\csc x \cot x + 2\cos x + C$ D) $-\csc x + \cos x + C$

Integrate the function.

187) $\int \frac{(9 - t^2)^{3/2}}{t^6} dt$ 187) ______

A) $-\frac{1}{5}\left(\frac{\sqrt{9-t^2}}{t}\right)^5 + C$ B) $-\frac{(9-t^2)^{5/2}}{45t^7}$

C) $-\frac{1}{45}\left(\frac{\sqrt{9-t^2}}{t}\right)^5 + \sec^{-1}\left(\frac{t}{3}\right) + C$ D) $-\frac{1}{45}\left(\frac{\sqrt{9-t^2}}{t}\right)^5 + C$

Evaluate the integral.

188) $\int x^2 4^x \, dx$ 188) ______

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

C) $\frac{x^2(4^x)}{\ln 4} - \frac{x(4^x)}{\ln^2 4} + \frac{2(4^x)}{\ln^2 4} + C$ D) $\frac{x^2(4^x)}{\ln 4} + \frac{2x(4^x)}{\ln^2 4} - \frac{2(4^x)}{\ln^3 4} + C$

Evaluate the integral by reducing the improper fraction and using a substitution if necessary.

189) $\int_0^1 \frac{18x^3}{9x^2 + 1} dx$ 189) ______

A) $2 - \ln 10$ B) $1 - \frac{1}{9}\ln 10$ C) $1 - \ln 10$ D) $2 - \frac{1}{9}\ln 10$

Evaluate the improper integral or state that it is divergent.

190) $\int_{-\infty}^{0} \frac{10}{(x-1)^2} dx$ 190) ______

A) 10 B) −10 C) 20 D) Divergent

Evaluate the integral.

191) $\int \sin^2 3x \cos^2 3x\, dx$ 191) ______

A) $-\frac{1}{12}\sin 3x \cos^3 3x + \frac{x}{8} + \frac{1}{48}\sin 6x + C$
B) $-\frac{1}{12}\sin 3x \cos^2 3x + \frac{x}{8} + \frac{1}{48}\sin 6x + C$
C) $-\frac{1}{3}\sin 3x \cos^3 3x + \frac{x}{8} + \frac{1}{3}\sin 6x + C$
D) $-\frac{1}{12}\sin 3x \cos^3 3x + \frac{x}{8} + \frac{1}{48}\cos 6x + C$

Solve the problem.

192) The voltage v (in volts) induced in a tape head is given by $v = t^2 e^{3t}$, where t is the time (in seconds). Find the average value of v over the interval from t = 0 to t = 2. Round to the nearest volt. 192) ______

A) 6 volts B) 194 volts C) 1564 volts D) 40 volts

Evaluate the integral.

193) $\int 23x \cos\frac{1}{2}x\, dx$ 193) ______

A) $46x \sin\left(\frac{1}{2}\right)x + 92\cos\left(\frac{1}{2}\right)x + C$
B) $23\sin\left(\frac{1}{2}\right)x + 46x\cos\left(\frac{1}{2}\right)x + C$
C) $92\sin\left(\frac{1}{2}\right)x - 46x\cos\left(\frac{1}{2}\right)x + C$
D) $23x\sin\left(\frac{1}{2}\right)x - 46\cos\left(\frac{1}{2}\right)x + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

194) $\int \frac{4x^3 - 5x^2 + 8x - 10}{(x^2+2)(x-2)^3}\, dx$ 194) ______

A) $2\ln|x-2| - \frac{2}{x-2} - \frac{3}{2(x-2)^2} + C$
B) $\frac{1}{x^2+2} - \frac{2}{x-2} - \frac{3}{2(x-2)^2} + C$
C) $\frac{4}{x-2} - \frac{5}{2(x-2)^3} + C$
D) $-\frac{4}{x-2} - \frac{3}{2(x-2)^2} + C$

Solve the problem.

195) Find the volume of the solid generated by revolving the region in the first quadrant bounded by the x-axis and the curve $y = x\cos x$, $0 \le x \le \pi/2$ about the y-axis. 195) ______

A) $\frac{\pi^3}{2} - 8\pi$ B) $\frac{\pi^3}{2} - 4\pi$ C) $\frac{\pi^3}{2} + 2\pi^2 - 4\pi$ D) $\frac{\pi^2}{2} - 4\pi$

Integrate the function.

196) $\int \sqrt{81 - x^2}\, dx$ 196) ______

A) $\frac{x}{81\sqrt{81-x^2}} + \frac{\sqrt{81-x^2}}{x} + C$
B) $\frac{81}{2}x - \frac{x\sqrt{81-x^2}}{2} + C$
C) $\frac{81x}{\sqrt{81-x^2}} + \frac{x}{2} + C$
D) $\frac{81}{2}\sin^{-1}\left(\frac{x}{9}\right) + \frac{x\sqrt{81-x^2}}{2} + C$

Use Simpson's Rule with n = 4 steps to estimate the integral.

197) $\int_{-\pi}^{0} \sin x\, dx$ 197) ______

A) $-\frac{2+\sqrt{2}}{6}\pi$ B) $-(1+2\sqrt{2})\pi$ C) $-\frac{1+2\sqrt{2}}{6}\pi$ D) $-\frac{1+\sqrt{2}}{4}\pi$

Evaluate the integral.

198) $\int \tan^5 2x\, dx$ 198) ______

A) $\frac{1}{8}\tan^4 2x - \frac{1}{4}\tan^2 2x + \frac{1}{2}\ln|\cos 2x| + C$
B) $-\frac{1}{8}\tan^4 2x + \frac{1}{4}\tan^2 2x - \frac{1}{2}\ln|\cos 2x| + C$
C) $\frac{1}{8}\tan^4 2x - \frac{1}{4}\tan^2 2x - \frac{1}{2}\ln|\cos 2x| + C$
D) $\frac{1}{4}\tan^4 2x - \frac{1}{2}\tan^2 2x - \ln|\cos 2x| + C$

Use a trigonometric substitution to evaluate the integral.

199) $\int \frac{dx}{x(1 + 36\ln^2 x)}$ 199) ______

A) $\frac{1}{6x}\tan^{-1}(6\ln x) + C$
B) $\frac{1}{72}\ln(1 + 36\ln^2 x) + C$
C) $\frac{1}{6}\tan^{-1}(6\ln x) + C$
D) $\frac{1}{6}\tan^{-1}(36\ln^2 x) + C$

Determine whether the improper integral converges or diverges.

200) $\int_{10}^{\infty} \frac{dx}{\sqrt[4]{x-8}}$ 200) ______

A) Diverges B) Converges

201) $\int_{-\infty}^{-5} (e^{100x} + x^3)dx$ 201) ______

A) Diverges B) Converges

Evaluate the integral.

202) $\int_{0}^{3} \frac{5e^{-t}}{1 + 25e^{-2t}}\, dt$ 202) ______

A) $\frac{1}{5}\tan^{-1}5 - \frac{1}{5}\tan^{-1}\frac{5}{e^3}$
B) $\tan^{-1}3 - \tan^{-1}5$
C) $\tan^{-1}\frac{5}{e^3} - \tan^{-1}5$
D) $\tan^{-1}5 - \tan^{-1}\frac{5}{e^3}$

Find the integral.

203) $\int \frac{x^3}{\sqrt{x^4+6}}dx$ 203) ______

A) $2\sqrt{x^4+6} + C$
B) $-\frac{1}{2}(x^4+6)^{-1/2} + C$
C) $\frac{1}{2}\sqrt{x^4+6} + C$
D) $\frac{1}{6}(x^4+6)^{3/2} + C$

Solve the problem.

204) Find the area between y = ln x and the x-axis from x = 1 to x = 3. 204) ______

A) 3 ln 3 − 3 B) 3 ln 3 + (−2) C) $\frac{2}{3}$ D) ln 3

Determine whether the improper integral converges or diverges.

205) $\int_{1}^{\infty} \frac{dx}{x^{6/7} + 6}$ 205) ______

A) Diverges B) Converges

Express the integrand as a sum of partial fractions and evaluate the integral.

206) $\int \frac{7x^3 + 49x^2 + 112x + 82}{(x+3)(x+2)^3}\, dx$ 206) ______

A) $\ln\left|(x+3)^2(x+2)^5\right| - \frac{2}{(x+2)} + \frac{1}{(x+2)^2} + C$
B) $\ln\left|(x+3)^2(x+2)^5\right| - \frac{3}{(x+2)^2} + C$
C) $\ln\left|(x+3)^2(x+2)^5\right| + \frac{1}{(x+2)^2} + C$
D) $\ln\left|(x+3)^2(x+2)^5\right| - \frac{1}{(x+2)} + \frac{2}{(x+2)^2} + C$

207) $\int \frac{4x^2 + x + 3}{(x^2+3)(x-9)}\, dx$ 207) ______

A) $\ln|x-9| + \frac{\sqrt{3}}{3}\tan^{-1}\left(\frac{x\sqrt{3}}{3}\right) + C$
B) $4\ln|x-9| + \tan^{-1}\left(\frac{x\sqrt{3}}{3}\right) + C$
C) $4\ln|x-9| + \frac{\sqrt{3}}{3}\tan^{-1}\left(\frac{x\sqrt{3}}{3}\right) + C$
D) $4\ln|x-9| + \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + C$

Integrate the function.

208) $\int \frac{x^3}{\sqrt{x^2+8}}dx$ 208) ______

A) $\frac{1}{3}\sqrt{x^2+8} - \frac{8}{\sqrt{x^2+8}} + C$
B) $\frac{1}{8}(x^2+8)^{3/2} - \sqrt{x^2+8} + C$
C) $\frac{1}{3}(x^2+8)^{3/2} + \tan^{-1}\left(\frac{x}{8}\right) + C$
D) $\frac{1}{3}(x^2+8)^{3/2} - 8\sqrt{x^2+8} + C$

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

209) $\int_{0}^{1} x\sin(x^2+2)\, dx$ 209) ______

x	$x\sin(x^2+2)$
0	0
0.125	0.11284
0.25	0.22038
0.375	0.31575
0.5	0.38904
0.625	0.42647
0.75	0.41045
0.875	0.32128
1	0.14112

A) S = 0.27980; E_S = 0.00712
B) S = 0.28693; E_S = 0.00000
C) S = 0.28335; E_S = 0.00000
D) S = 0.29217; E_S = −0.00525

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

210) $\int_{0}^{2} (x^4 + 3)\, dx$ 210) ______

A) $\frac{209}{8}$ B) $\frac{209}{16}$ C) $\frac{297}{16}$ D) $\frac{149}{12}$

Evaluate the integral.

211) $\int_{0}^{\pi/4} \sin^7 y\, dy$ 211) ______

A) $\frac{16}{35}$ B) $-\frac{177\sqrt{2}}{560}$ C) $\frac{128 - 119\sqrt{2}}{560}$ D) $\frac{256 - 177\sqrt{2}}{560}$

Evaluate the improper integral.

212) $\int_{0}^{2} \frac{dx}{\sqrt{4 - x^2}}$ 212) ______

A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) 4 D) 1

Express the integrand as a sum of partial fractions and evaluate the integral.

213) $\int \frac{2x + 23}{x^2 + 11x + 28}\, dx$ 213) ______

A) $\ln\left|\frac{(x+4)^4}{(x+7)^5}\right| + C$
B) $\ln\left|\frac{(x+4)^6}{(x+7)^5}\right| + C$
C) $\ln\left|\frac{(x+4)^3}{(x+7)^5}\right| + C$
D) $\ln\left|\frac{(x+4)^5}{(x+7)^3}\right| + C$

Evaluate the integral.

214) $\int (\csc t - \sin t)(\cot t + \csc t)\, dt$ 214) ______

A) $-\csc t - \cot t - \sin t - t + C$ B) $\cot t + 2\sin t - t + C$

C) $-\csc t - \tan t - \sin t + C$ D) $-\csc t - t + C$

Determine whether the improper integral converges or diverges.

215) $\int_1^{\infty} \frac{\ln |x|}{x} dx$ 215) ______

A) Converges B) Diverges

Evaluate the integral by multiplying by a form of 1 and using a substitution (if necessary) to reduce it to standard form.

216) $\int \frac{1}{5 + 5\sec x} dx$ 216) ______

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

C) $\frac{1}{5}(\cot x - \csc x + x) + C$ D) $\cot x - \csc x + x + C$

Evaluate the integral by reducing the improper fraction and using a substitution if necessary.

217) $\int \frac{4x}{4x + 3} dx$ 217) ______

A) $x - \ln|4x + 3| + C$ B) $x - \frac{3}{4}\ln|4x + 3| + C$

C) $x + \frac{3}{4}\ln|4x + 3| + C$ D) $\ln|4x + 3| + C$

Evaluate the integral by using a substitution prior to integration by parts.

218) $\int x^2 \sqrt{x + 14}\, dx$ 218) ______

A) $\frac{(30x^2 - 336x + 3136)(x + 14)^{3/2}}{105} + C$ B) $\frac{(15x^2 - 168x + 1568)(x + 14)^{3/2}}{105} + C$

C) $\frac{(30x^2 - 336x + 224)(x + 14)^{3/2}}{105} + C$ D) $\frac{(30x^2 - 336x + 3136)\sqrt{(x + 14)}}{105} + C$

Solve the initial value problem for y as a function of x.

219) $\sqrt{9 - x^2}\frac{dy}{dx} = 1,\ x < 3,\ y(0) = 14$ 219) ______

A) $y = \ln|\sec x + \tan x|$ B) $y = \sin^{-1}\frac{x}{3}$

C) $y = \ln|\sec x + \tan x| + 14$ D) $y = \sin^{-1}\frac{x}{3} + 14$

Evaluate the integral.

220) $\int \frac{-\sin t\,(3\cos t + 4)\, dt}{\cos^2 t - 6\cos t + 9}$ 220) ______

A) $3\ln|\cos t - 3| + 13(\cos t - 3)^{-1} + C$ B) $3\ln|t - 3| - 13(t - 3)^{-1} + C$

C) $3\ln|\cos t - 3| - 13(\cos t - 3)^{-1} + C$ D) $4\ln|\cos t - 3| - 9(\cos t - 3)^{-1} + C$

Solve the problem.

221) Estimate the minimum number of subintervals needed to approximate the integral 221) ______

$\int_0^{\pi} 6\cos x\, dx$

with an error of magnitude less than 10^{-4} using Simpson's Rule.

A) 16 B) 19 C) 20 D) 18

Evaluate the integral.

222) $\int_0^{\pi/12} \sin^3 24x\, dx$ 222) ______

A) $-\frac{1}{18}$ B) $-\frac{1}{6}$ C) $-\frac{1}{36}$ D) $\frac{1}{36}$

Use integration by parts to establish a reduction formula for the integral.

223) $\int \tan^n x\, dx,\ n \neq 1$ 223) ______

A) $\int \tan^n x\, dx = \frac{1}{n - 1}\tan^{n-1} x + \int \tan^{n-1} x\, dx$

B) $\int \tan^n x\, dx = \frac{1}{n - 1}\tan^{n-2} x - \int \tan^{n-1} x\, dx$

C) $\int \tan^n x\, dx = \tan^{n-1} x - \frac{1}{n - 1}\int \tan^{n-2} x\, dx$

D) $\int \tan^n x\, dx = \frac{1}{n - 1}\tan^{n-1} x - \int \tan^{n-2} x\, dx$

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

224) $\int_0^1 \frac{2}{1 + x^2} dx$ 224) ______

A) $\frac{5323}{1700}$ B) $\frac{3299}{1700}$ C) $\frac{9403}{3400}$ D) $\frac{5323}{3400}$

Use a trigonometric substitution to evaluate the integral.

225) $\int \frac{dx}{x\sqrt{9 + \ln^2 x}}$ 225) ______

A) $\sin^{-1}\left(\frac{\ln x}{3}\right) + C$ B) $\sinh^{-1}\left(\frac{\ln x}{3}\right) + C$

C) $\cosh^{-1}\left(\frac{\ln x}{3}\right) + C$ D) $\tan^{-1}\left(\frac{\ln x}{3}\right) + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

226) $\int \frac{8x^3 + 30x^2 + 52x + 8}{x^2(x^2 + 4x + 8)} dx$ 226) ______

A) $5\ln|x| + \frac{1}{x} - \ln|x^2 + 4x + 8| + \sin^{-1}\frac{(x + 2)}{2} + C$

B) $6\ln|x| - \frac{1}{x} + \ln|x^2 + 4x + 8| + \frac{1}{2}\tan^{-1}\frac{(x + 2)}{2} + C$

C) $6\ln\left|x - \frac{1}{x}\right| + \ln|x^2 + 4x + 8| + \frac{1}{2}\tan^{-1}\frac{(x + 2)}{2} + C$

D) $7\ln|x| + \ln|x^2 + 4x + 8| + \frac{1}{2}\tan^{-1}\frac{(x + 2)}{2} + C$

Evaluate the integral by making a substitution and then using a table of integrals.

227) $\int \frac{\sqrt{x}}{\sqrt{16 - x}} dx$ 227) ______

A) $16\sin^{-1}\left(\frac{\sqrt{x}}{4}\right) + x\sqrt{16 - x} + C$ B) $16\sin^{-1}\left(\frac{x}{4}\right) - \sqrt{16 - x} + C$

C) $16\sin^{-1}\left(\frac{\sqrt{x}}{4}\right) - \sqrt{x}\sqrt{16 - x} + C$ D) $\sqrt{16 - x} - 4\ln\left|\frac{4 + \sqrt{16 - x}}{x}\right| + C$

Evaluate the integral.

228) $\int (2x - 1)\ln(24x)\, dx$ 228) ______

A) $(x^2 - x)\ln 24x - \frac{x^2}{2} + x + C$ B) $(x^2 - x)\ln 24x - x^2 + x + C$

C) $(x^2 - x)\ln 24x - \frac{x^2}{2} + 2x + C$ D) $\left(\frac{x^2}{2} - x\right)\ln 24x - \frac{x^2}{4} + x + C$

Evaluate the improper integral or state that it is divergent.

229) $\int_{-\infty}^{\infty} 14xe^{-x}\, dx$ 229) ______

A) −14 B) 0 C) Divergent D) 14

Use your calculator to approximate the integral using the method indicated.

230) Trapezoidal Rule, $\int_0^4 \left(2 + \frac{1}{x + 3}\right) dx$, n = 100 230) ______

A) 8.8473 B) 8.9236 C) 8.7751 D) 8.8303

Solve the problem.

231) Find the volume of the solid generated by revolving the region bounded by the curve $y = \ln x$, the x–axis, and the vertical line $x = e^2$ about the x–axis. 231) ______

A) $2\pi(e^2 - 1)$ B) $\pi(e^2 - 1)$ C) $\pi(e - 1)$ D) πe

Evaluate the integral by separating the fraction and using a substitution if necessary.

232) $\int \frac{x + \sqrt{x + 4}}{x\sqrt{x + 4}} dx$ 232) ______

A) $2\sqrt{x + 4} + \ln|x| + C$ B) $\sin^{-1}\left(\frac{x}{4}\right) + \ln|x| + C$

C) $\frac{2}{3}(x + 4)^{3/2} + \ln|x| + C$ D) $\sqrt{x + 4} - \frac{1}{x^2} + C$

Find the integral.

233) $\int x^4\sqrt{x^5 + 2}\, dx$ 233) ______

A) $\frac{2}{15}(x^5 + 2)^{3/2} + C$ B) $\frac{2}{3}(x^5 + 2)^{3/2} + C$

C) $\frac{1}{10\sqrt{x^5 + 2}} + C$ D) $\frac{2}{15}x^5(x^5 + 2)^{3/2} + C$

Use the substitution z = tan (x/2) to evaluate the integral.

234) $\int_{\pi/4}^{\pi/3} \frac{dx}{(1 - \cos x)^2}$ 234) ______

A) 1.3592 B) −0.8202 C) 0.8202 D) 1.8202

Use a trigonometric substitution to evaluate the integral.

235) $\int \frac{dx}{x\sqrt{x^2 - 16}}$ 235) ______

A) $\frac{1}{4}\sec^{-1}\left|\frac{x}{4}\right| + C$ B) $4\sec^{-1} x + C$ C) $\frac{1}{4}\sin^{-1}\frac{x}{4} + C$ D) $\sin^{-1}\frac{x}{4} + C$

Solve the problem by integration.

236) Find the first–quadrant area bounded by $y = \frac{1}{x^3 + 4x^2 + 3x}$, x = 2, and x = 5. 236) ______

A) $\frac{1}{6}\ln\frac{5}{4}$ B) $6\ln\frac{108}{625}$ C) $\frac{1}{3}\ln\frac{135}{256}$ D) $\frac{1}{6}\ln\frac{108}{625}$

Solve the problem.

237) Find the length of the curve $y = \ln(\csc x)$, $\pi/3 \le x \le \pi/2$ 237) ______

A) $\ln(2\sqrt{3})$ B) $\ln(\sqrt{3})$ C) $1 - \ln(\sqrt{3})$ D) $\ln(\sqrt{3} + 1)$

Evaluate the integral.

238) $\int \frac{2x^2}{\sqrt{9 - x^2}} dx$ 238) ______

A) $\sqrt{9 - x^2} - 3\ln\left|\frac{3 + \sqrt{9 - x^2}}{x}\right| + C$ B) $9\sin^{-1}\left(\frac{x}{3}\right) - \sqrt{9 - x^2} + C$

C) $9\sin^{-1}\left(\frac{x}{3}\right) - x\sqrt{9 - x^2} + C$ D) $-3\sin^{-1}\left(\frac{x}{3}\right) - x^2\sqrt{9 - x^2} + C$

Solve the problem.

239) Find the volume of the solid generated by revolving the region under $y = \sin x^2$, $0 \le x \le \frac{\pi}{2}$, about the y–axis. 239) ______

A) $\frac{\pi}{2}$ B) 2π C) $\frac{\pi}{4}$ D) π

Solve the problem by integration.

240) Find the first–quadrant area bounded by $y = \frac{18x^2 + 60x + 30}{(x^2 + 5)(x + 5)}$, and $x = 5$. 240) ______

A) 3 ln 12 B) 6 ln 300 C) $6 \ln \frac{1}{12}$ D) 6 ln 12

Provide an appropriate response.

241) A student knows that $\int_a^{+\infty} f(x)\,dx$ diverges, but needs to investigate $\int_a^{+\infty} g(x)\,dx$, where $g(x) = \frac{f(x)}{33}$. Does this integral necessarily also diverge? 241) ______

A) Yes B) No

Evaluate the integral by using trigonometric identities and substitutions to reduce it to standard form.

242) $\int \frac{\tan^2 x}{1 + \tan^2 x}\,dx$ 242) ______

A) $\tan x - x + C$ B) $x - \sin 2x + C$

C) $\frac{1}{2}x + \frac{1}{4}\sin 2x + C$ D) $\frac{1}{2}x - \frac{1}{4}\sin 2x + C$

Solve the problem.

243) Find the area of the region enclosed by the curve $y = x \sin x$ and the x–axis for $8\pi \le x \le 9\pi$. 243) ______

A) 0 B) 16π C) 17π D) 16

Evaluate the integral.

244) $\int_0^1 \frac{dx}{\sqrt{64 - x^2}}$ 244) ______

A) $\frac{1}{8}\sin^{-1}\frac{1}{8}$ B) $8\cos^{-1}\frac{1}{8}$ C) $\sin^{-1}\frac{1}{8}$ D) $\cos^{-1}\frac{1}{8}$

Express the integrand as a sum of partial fractions and evaluate the integral.

245) $\int \frac{32\,dx}{x^3 - 4x}$ 245) ______

A) $-8 \ln|x| + \frac{1}{2}\tan^{-1}\frac{x}{2} + C$ B) $-\frac{8}{x} + 4\ln|x - 2| + 4\ln|x + 2| + C$

C) $-8 \ln|x| + 4\ln|x - 2| + 4\ln|x + 2| + C$ D) $8 \ln|x| - 4\ln|x - 2| - 4\ln|x + 2| + C$

Use a trigonometric substitution to evaluate the integral.

246) $\int \frac{dx}{2\sqrt{x}(1 + x)}$ 246) ______

A) $\tan^{-1}\sqrt{x} + C$ B) $\frac{1}{2}\ln|x| + C$ C) $\frac{1}{2}\tan^{-1}\sqrt{x} + C$ D) $\frac{1}{2}\sin^{-1}\sqrt{x} + C$

Solve the problem.

247) Find an upper bound for the error in estimating $\int_0^4 (3x + 3)\,dx$ using the Trapezoidal Rule with n = 7 steps. 247) ______

A) $\frac{4}{49}$ B) $\frac{16}{49}$ C) $\frac{16}{147}$ D) 0

Evaluate the improper integral or state that it is divergent.

248) $\int_1^\infty \frac{1}{8x(x + 1)^2}\,dx$ 248) ______

A) 1.569 B) Divergent C) –1.569 D) 0.024

Determine whether the improper integral converges or diverges.

249) $\int_0^{\pi/2} \frac{\sin\sqrt{t}}{\sqrt{t}}\,dt$ 249) ______

A) Converges B) Diverges

Evaluate the integral.

250) $\int (\cos x)\,10^{\sin x}\,dx$ 250) ______

A) $\frac{\sin x}{\ln 10} + C$ B) $10^{\sin x} + C$ C) $\frac{10^{\cos x}}{\ln 10} + C$ D) $\frac{10^{\sin x}}{\ln 10} + C$

Evaluate the integral by eliminating the square root.

251) $\int_0^{\pi/6} \sqrt{1 + \cos 6\theta}\,d\theta$ 251) ______

A) 0 B) $3\sqrt{2}$ C) $\frac{\sqrt{2}}{3}$ D) $\sqrt{2}$

Determine whether the improper integral converges or diverges.

252) $\int_0^\pi \frac{\sin\theta\,d\theta}{(\pi - \theta)^{7/9}}$ 252) ______

A) Converges B) Diverges

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

253) $\int_0^1 x\sqrt{x^2 + 2}\,dx$ 253) ______

x	$x\sqrt{x^2 + 2}$
0	0
0.125	0.17747
0.25	0.35904
0.375	0.54866
0.5	0.75
0.625	0.96635
0.75	1.20059
0.875	1.45514
1	1.73205

A) S = 0.79041; E_S = 0.00000 B) S = 0.71941; E_S = 0.06983

C) S = 0.78924; E_S = 0.00000 D) S = 0.89866; E_S = –0.10942

Evaluate the integral by using a substitution prior to integration by parts.

254) $\int x\sqrt{5 - x}\,dx$ 254) ______

A) $-\frac{2}{3}x(5 - x)^{3/2} - \frac{4}{15}(5 - x)^{5/2} + C$ B) $-\frac{2}{3}x(5 - x)^{3/2} + \frac{4}{15}(5 - x)^{5/2} + C$

C) $-\frac{2}{3}x(5 - x)^{3/2} - \frac{2}{5}(5 - x)^{5/2} + C$ D) $\frac{2}{3}x(5 - x)^{3/2} + \frac{4}{15}(5 - x)^{5/2} + C$

Integrate the function.

255) $\int_{-1}^1 \frac{8}{1 + 64t^2}\,dt$ 255) ______

A) $2\tan^{-1} 8$ B) $2\tan^{-1}\left(\frac{1}{8}\right)$ C) $\frac{\pi}{2}$ D) $2\sin^{-1} 8$

Evaluate the integral.

256) $\int \frac{-\sin x}{1 + \cos x}\,dx$ 256) ______

A) $\ln|1 + \cos x| + C$ B) $\frac{\cos x\ x}{x + \sin x} + C$

C) $\frac{-\cos x}{x + \sin x} + C$ D) $-\ln|1 + \cos x| + C$

Evaluate the integral by using trigonometric identities and substitutions to reduce it to standard form.

257) $\int 2\cos^2 x\,dx$ 257) ______

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

Determine whether the improper integral converges or diverges.

258) $\int_{-\infty}^{\infty} 5xe^{-x^2}\,dx$ 258) ______

A) Converges B) Diverges

Solve the problem.

259) Find an upper bound for the error in estimating $\int_0^5 (8x^2 - 9)\,dx$ using Simpson's Rule with n = 12 steps. 259) ______

A) $\frac{625}{373248}$ B) $\frac{625}{46656}$ C) 0 D) $\frac{625}{93312}$

260) Estimate the area of the surface generated by revolving the curve $y = \cos 2x$, $0 \le x \le \pi/4$ about the x–axis.
Use the Trapezoidal Rule with n = 6. 260) ______

A) 4.606 B) 5.108 C) 4.652 D) 7.091

Evaluate the integral.

261) $\int 3\cos^3 x \sin^7 x\,dx$ 261) ______

A) $\frac{3}{8}(\sin^8 x - \sin^{10} x) + C$ B) $\frac{1}{2}\cos^6 x - \frac{3}{8}\cos^8 x + C$

C) $\frac{3}{8}\sin^8 x - \frac{3}{10}\sin^{10} x + C$ D) $\frac{1}{2}\sin^6 x - \frac{3}{10}\cos^{10} x + C$

Evaluate the integral by reducing the improper fraction and using a substitution if necessary.

262) $\int \frac{4t^3 + t^2 + 64t}{t^2 + 16}\,dt$ 262) ______

A) $2t^2 + t - \ln|t^2 + 16| + C$ B) $2t^2 + t + \tan^{-1}\left(\frac{t}{16}\right) + C$

C) $2t^2 + t - 4\tan^{-1}\left(\frac{t}{4}\right) + C$ D) $4t - \ln|t^2 + 16| + C$

Solve the problem.

263) Estimate the minimum number of subintervals needed to approximate the integral $\int_0^2 (7x^3 - 4x)\,dx$ with an error of magnitude less than 10^{-4} using Simpson's Rule. 263) ______

A) 0 B) 2 C) 12 D) 1

Evaluate the integral.

264) $\int x \cosh 5x\,dx$ 264) ______

A) $\frac{x}{5}\sinh 5x - \frac{1}{25}\cosh 5x + C$ B) $\frac{x}{5}\sinh 5x - \frac{1}{5}\cosh 5x + C$

C) $\frac{1}{5}\sinh 5x - \frac{1}{25}\cosh 5x + C$ D) $\frac{x}{5}\cosh 5x - \frac{1}{25}\sinh 5x + C$

265) $\int \frac{dx}{x\sqrt{3+4x}}$ 265) ______

A) $\frac{\sqrt{3}}{3} \ln \left| \frac{\sqrt{3+4x} - \sqrt{3}}{\sqrt{3+4x} + \sqrt{3}} \right| + C$
B) $-\frac{\sqrt{3}}{3} \ln \left| \frac{\sqrt{3+4x} - \sqrt{3}}{\sqrt{3+4x} + \sqrt{3}} \right| + C$
C) $\frac{\sqrt{3}}{3} \ln \left| \frac{\sqrt{3+4x} + \sqrt{3}}{\sqrt{3+4x} - \sqrt{3}} \right| + C$
D) $-\frac{\sqrt{3}}{3} \ln \left| \frac{\sqrt{3+4x} + \sqrt{3}}{\sqrt{3+4x} - \sqrt{3}} \right| + C$

266) $\int_0^{\pi/2} x^3 \cos 3x \, dx$ 266) ______

A) $\frac{1}{3}x^3 \sin 3x + \frac{1}{3}x^2 \cos 3x - \frac{2}{9}x \sin 3x - \frac{2}{27} \cos 3x + C$
B) $\frac{1}{3}x^3 \cos 3x + \frac{1}{3}x^2 \sin 3x - \frac{2}{9}x \cos 3x - \frac{2}{27} \sin 3x + C$
C) $\frac{1}{3}x^3 \sin 3x - \frac{1}{3}x^2 \cos 3x + \frac{2}{9}x \sin 3x + \frac{2}{27} \cos 3x + C$
D) $\frac{1}{3}x^3 \sin 3x + 1x^2 \cos 3x - 2x \sin 3x - 2 \cos 3x + C$

267) $\int_0^4 x^4 \ln 9x \, dx$ 267) ______

A) 699.77 B) 774.86 C) 692.94 D) −201.22

Use a trigonometric substitution to evaluate the integral.

268) $\int \frac{e^x \, dx}{\sqrt{1 - e^{2x}}}$ 268) ______

A) $e^x \sin^{-1}(e^x) + C$
B) $\sin^{-1}(e^x) + C$
C) $\sec^{-1}(e^x) + C$
D) $-2\sqrt{1 - e^{2x}} + C$

Use Simpson's Rule with n = 4 steps to estimate the integral.

269) $\int_0^2 (x^4 + 1) \, dx$ 269) ______

A) $\frac{145}{16}$ B) $\frac{161}{24}$ C) $\frac{101}{24}$ D) $\frac{101}{12}$

Find the integral.

270) $\int_0^1 4x\left(\sqrt[4]{1 + x^2}\right) dx$ 270) ______

A) $\frac{16}{5}(2^{5/4} - 1)$ B) $\frac{8}{5}(2^{5/4} - 1)$ C) $2(2^{5/4} - 1)$ D) $\frac{16}{5}\sqrt[4]{2}$

Determine whether the improper integral converges or diverges.

271) $\int_0^2 \frac{e^{-\sqrt{x-1}}}{\sqrt{x-1}} \, dx$ 271) ______

A) Converges B) Diverges

Evaluate the integral by making a substitution and then using a table of integrals.

272) $\int e^x \sqrt{25 - e^{2x}} \, dx$ 272) ______

A) $\frac{25}{2} \sin^{-1}\left(\frac{e^x}{5}\right) + C$
B) $\frac{e^x}{2}\sqrt{25 - e^{2x}} + \frac{25}{2} \sin^{-1}\left(\frac{e^x}{5}\right) + C$
C) $\frac{e^x}{2}\sqrt{25 - e^{2x}} + \frac{25}{2} \ln \left| e^x + \sqrt{e^{2x} - 25} \right| + C$
D) $\frac{e^x}{2}\sqrt{25 - e^{2x}} + \frac{25}{2} \ln \left| x + \sqrt{x^2 - 25} \right| + C$

Evaluate the integral.

273) $\int \sin 4t \sin \frac{t}{3} \, dt$ 273) ______

A) $\frac{3}{22} \cos \frac{11}{3}t + \frac{3}{26} \cos \frac{13}{3}t + C$
B) $\frac{3}{22} \sin t - \frac{3}{26} \sin 7t + C$
C) $\frac{3}{22} \sin \frac{11}{3}t - \frac{3}{26} \sin \frac{13}{3}t + C$
D) $\frac{22}{3} \sin \frac{11}{3}t - \frac{26}{3} \sin \frac{13}{3}t + C$

274) $\int \frac{dx}{36 + x^2}$ 274) ______

A) $\frac{1}{6} \tan^{-1} \frac{x}{6} + C$
B) $6 \tan^{-1} \frac{x}{6} + C$
C) $\frac{1}{6} \tan^{-1} (x + 6) + C$
D) $\frac{1}{6} \tan^{-1} 6x + C$

Solve the problem.

275) Find the volume of the solid generated by revolving the region in the first quadrant bounded by the coordinate axes, the curve $y = e^{-5x}$, and the line $x = 8$ about the y-axis. 275) ______

A) $-\frac{2}{25}\pi(1 + 41 e^{-40})$
B) $\frac{2}{25}\pi(1 - 40 e^{-40})$
C) $\frac{2}{25}\pi(1 - 39 e^{-40})$
D) $\frac{2}{25}\pi(1 - 41 e^{-40})$

Use Simpson's Rule with n = 4 steps to estimate the integral.

276) $\int_0^2 3x^2 \, dx$ 276) ______

A) 8 B) $\frac{33}{4}$ C) 4 D) 7

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

277) $\int_0^2 \frac{y \, dy}{(y^2 + 1)^2}$ 277) ______

y	$y/(y^2 + 1)^2$
0	0
0.25	0.22145
0.5	0.32
0.75	0.3072
1	0.25
1.25	0.19036
1.5	0.14201
1.75	0.10604
2	0.08

A) $T = 0.39427$; $E_T = 0.00574$
B) $T = 0.78853$; $E_T = 0.01147$
C) $T = 0.40427$; $E_T = -0.00427$
D) $T = 0.40035$; $E_T = -0.00035$

Evaluate the integral.

278) $\int \frac{5e^{1/y}}{3y^2} \, dy$ 278) ______

A) $-\frac{5}{3} e^{1/y} + C$ B) $\frac{5e^{1/y}}{3} 6y + C$ C) $\frac{5e^{1/y}}{y^3} + C$ D) $\frac{5}{3} e^{1/y} + C$

Expand the quotient by partial fractions.

279) $\frac{5x + 43}{(x + 3)(x + 7)}$ 279) ______

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

Solve the problem.

280) The height of a vase is 5 inches. The table shows the circumference of the vase (in inches) at half-inch intervals starting from the top down. Estimate the volume of the vase by using the Trapezoidal rule with n = 10. 280) ______
[Hint: you will first need to find the areas of the cross-sections that correspond to the given circumferences.]

Circumferences	
4.7	8.1
4.2	9.4
4.1	10.1
4.8	8.5
5.6	6.4
6.8	

A) 20.014 in.^{3} B) 33.575 in.^{3} C) 32.325 in.^{3} D) 19.689 in.^{3}

Find the integral.

281) $\int \frac{t^2 + 2}{t^3 + 6t + 7} \, dt$ 281) ______

A) $-\frac{3}{(t^3 + 6t + 7)^2} + C$
B) $3 \ln\left|t^3 + 6t + 7\right| + C$
C) $\frac{\ln\left|t^3 + 6t + 7\right|}{3} + C$
D) $-\frac{1}{3(t^3 + 6t + 7)^2} + C$

Evaluate the integral.

282) $\int \frac{dx}{\sqrt{-x^2 + 6x + 16}}$ 282) ______

A) $\frac{1}{5}\tan^{-1}\left(\frac{x - 3}{5}\right) + C$
B) $\sin^{-1}\left(\frac{x + 3}{5}\right) + C$
C) $\sin^{-1}\left(\frac{x - 6}{5}\right) + C$
D) $\sin^{-1}\left(\frac{x - 3}{5}\right) + C$

Integrate the function.

283) $\int \frac{y^2}{(25 - y^2)^{3/2}} \, dy$ 283) ______

A) $\sqrt{25 - y^2} - \sin^{-1}\left(\frac{y}{5}\right) + C$
B) $\frac{y}{\sqrt{25 - y^2}} + C$
C) $\frac{5y}{\sqrt{25 - y^2}} - \sin^{-1}y + C$
D) $\frac{y}{\sqrt{25 - y^2}} - \sin^{-1}\left(\frac{y}{5}\right) + C$

Evaluate the integral.

284) $\int \frac{x}{7} \tan\left(\frac{x}{7}\right)^2 dx$ 284) ______

A) $\frac{7}{2} \ln\left|\sin\left(\frac{x}{7}\right)^2\right| + C$
B) $-\frac{7}{2} \ln\left|\cos\left(\frac{x}{7}\right)^2\right| + C$
C) $\frac{7}{2} \sec^2\left(\frac{x}{7}\right)^2 + C$
D) $-\frac{1}{14}x^2 \ln\left|\cos\left(\frac{x}{7}\right)^2\right| + C$

Solve the problem.

285) Find the area of the region bounded from above and below by the curves $y = \sec^2 x$ and $y = \cos x$, $0 \le x \le \frac{\pi}{4}$, and on the right by the line $x = \frac{\pi}{4}$. 285) ______

A) 0.2929 B) 0.7071 C) 1.7071 D) 1.0000

Determine whether the improper integral converges or diverges.

286) $\int_0^{\pi/2} \sec \theta \, d\theta$ 286) ______

A) Converges B) Diverges

Use integration by parts to establish a reduction formula for the integral.

287) $\int \csc^n x \, dx,\ n \neq 1$ 287) ______

A) $\int \csc^n x\,dx = \frac{-1}{n-1}\csc^{n-2} x \cot x - \frac{n-1}{n}\int \csc^{n-1} x\,dx$

B) $\int \csc^n x\,dx = \frac{-1}{n-1}\csc^{n-2} x \cot x + \frac{n-2}{n-1}\int \csc^{n-2} x\,dx$

C) $\int \csc^n x\,dx = \frac{-1}{n-1}\csc^{n-2} x \cot x - \frac{n-2}{n-1}\int \csc^{n-2} x \cot x\,dx$

D) $\int \csc^n x\,dx = \csc^{n-2} x \cot x + (n-2)\int \csc^{n-2} x\,dx$

Find the integral.

288) $\int \frac{dx}{x(\ln x)^{10}}$ 288) ______

A) $\frac{1}{x(\ln x)^{11}} + C$ B) $-\frac{1}{9x(\ln x)^9} + C$

C) $-\frac{1}{11(\ln x)^{11}} + C$ D) $-\frac{1}{9(\ln x)^9} + C$

Provide the proper response.

289) The error formula for Simpson's Rule depends upon 289) ______

i) $f(x)$.
ii) $f''(x)$.
iii) $f^{(4)}(x)$
iv) the number of steps

A) ii and iv B) i and iii C) iii and iv D) i, iii, and iv

Evaluate the integral.

290) $\int \sin^3 3x \sec^5 3x\,dx$ 290) ______

A) $\frac{\tan^4 3x \sec 3x}{12} + C$ B) $\frac{\sec^6 3x}{6} + C$

C) $\frac{\tan^4 3x}{12} + C$ D) $\frac{\tan^6 3x}{6} + C$

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

291) $\int_0^2 4x^2\,dx$ 291) ______

A) 22 B) $\frac{32}{3}$ C) 15 D) 11

Evaluate the integral.

292) $\int \frac{e^t\,dt}{e^{2t} - 9e^t + 8}$ 292) ______

A) $\frac{1}{7}\ln|t-8| - \frac{1}{7}\ln|t-1| + C$ B) $\frac{1}{7}\ln|e^t-8| - \frac{1}{7}\ln|e^t-1| + C$

C) $\frac{1}{7}\ln|e^t-8| + \frac{1}{7}\ln|e^t-1| + C$ D) $\frac{1}{7}e^t\ln|e^t-8| - \frac{1}{7}e^t\ln|e^t-1| + C$

293) $\int \cot^4 3x\,dx$ 293) ______

A) $-\frac{\cot^3 3x}{9} + \frac{1}{3}\cot 3x + x + C$ B) $-\frac{\cot^2 3x}{9} + \frac{1}{3}\cot 3x - x + C$

C) $-\frac{\cot^3 3x}{3} - \frac{1}{3}\cot 3x + x + C$ D) $-\frac{\cot^3 3x}{9} + \frac{1}{3}\cot 3x + C$

294) $\int \frac{3e^{2t} + 4e^t}{e^{2t} - 4e^t + 4}\,dt$ 294) ______

A) $3\ln|e^t-2| - 10(e^t-2)^{-1} + C$ B) $3\ln|t-2| - 10(t-2)^{-1} + C$

C) $4\ln|e^t-2| - 6(e^t-2)^{-1} + C$ D) $3\ln|e^t-2| + 10(e^t-2)^{-1} + C$

Expand the quotient by partial fractions.

295) $\frac{y+6}{y^2(y+1)}$ 295) ______

A) $\frac{6}{y^2} + \frac{5}{y+1}$ B) $\frac{5}{y} + \frac{6}{y^2} + \frac{5}{y+1}$

C) $-\frac{5}{y} + \frac{6}{y^2} + \frac{6}{y+1}$ D) $-\frac{5}{y} + \frac{6}{y^2} + \frac{5}{y+1}$

Evaluate the integral.

296) $\int_0^6 \frac{dx}{x^2 + 10x + 29}$ 296) ______

A) $\sin^{-1}\left(\frac{11}{2}\right) - \sin^{-1}\left(\frac{5}{2}\right)$ B) $\frac{1}{2}\tan^{-1}\left(\frac{11}{2}\right)$

C) $\tan^{-1}\left(\frac{11}{2}\right) - \tan^{-1}\left(\frac{5}{2}\right)$ D) $\frac{1}{2}\tan^{-1}\left(\frac{11}{2}\right) - \frac{1}{2}\tan^{-1}\left(\frac{5}{2}\right)$

Solve the initial value problem for y as a function of x.

297) $(x^2 + 64)^2 \frac{dy}{dx} = \sqrt{x^2 + 64}$, $y(0) = 8$ 297) ______

A) $y = \frac{x}{64} + 8$ B) $y = \frac{x}{64\sqrt{x^2 + 64}}$

C) $y = \frac{x}{64\sqrt{x^2 + 64}} + 8$ D) $y = \frac{x}{8} + 8$

Evaluate the integral.

298) $\int_{-\pi/15}^{\pi/15} \sec^3 5x\,dx$ 298) ______

Give your answer in exact form.

A) $\frac{2}{5} + \frac{1}{10}\ln 4$ B) $\frac{\sqrt{3}}{5} + \frac{1}{10}\ln(7 + 4\sqrt{3})$

C) $\frac{2\sqrt{3}}{5} + \frac{1}{10}\ln(7 + 4\sqrt{3})$ D) $\frac{2\sqrt{3}}{5} + \frac{1}{10}\ln(2\sqrt{3})$

Expand the quotient by partial fractions.

299) $\frac{x^2 - 3x + 26}{x^2 - 10x + 24}$ 299) ______

A) $1 + \frac{22}{x-6} + \frac{15}{x-4}$ B) $\frac{22}{x-6} - \frac{15}{x-4}$

C) $1 + \frac{22}{x-6} - \frac{15}{x-4}$ D) $\frac{x+22}{x-6} - \frac{x+15}{x-4}$

Evaluate the integral.

300) $\int \csc^3 4t\,dt$ 300) ______

A) $\frac{\csc 4t \cot^2 4t}{8} - \frac{1}{8}\ln|\csc 4t + \cot 4t| + C$

B) $-\frac{\csc 4t \cot 4t}{2} + \frac{1}{2}\ln|\csc 4t + \cot 4t| + C$

C) $-\frac{\csc 4t \cot 4t}{8} - \frac{1}{8}\ln|\csc 4t + \cot 4t| + C$

D) $-\frac{\csc 4t \cot 4t}{2} - \frac{1}{2}\ln|\csc 4t + \cot 4t| + \frac{x}{4} + C$

301) $\int \sec^3 4x\,dx$ 301) ______

A) $\frac{1}{8}\sec^2 4x \tan 4x + \frac{1}{8}\ln|\sec 4x + \tan 4x| + C$ B) $\frac{1}{8}\sec 4x \tan 4x + \frac{1}{8}\ln|\sec 4x + \tan 4x| + C$

C) $\frac{1}{2}\sec 4x \tan 4x - \frac{1}{2}\ln|\sec 4x + \tan 4x| + C$ D) $\frac{1}{8}\sec 4x \tan 4x + \frac{x}{8} + C$

Solve the problem.

302) Find an upper bound for the error in estimating $\int_4^5 \frac{1}{(x-1)^2}dx$ using the Trapezoidal Rule with n = 4 steps. 302) ______

A) $\frac{1}{8192}$ B) $\frac{1}{7776}$ C) $\frac{1}{2592}$ D) $\frac{125}{2592}$

Evaluate the integral by using a substitution prior to integration by parts.

303) $\int (\ln 6x)^2\,dx$ 303) ______

A) $x(\ln 6x)^2 + 2x(\ln 6x) - 2x + C$ B) $x(\ln 6x)^2 - x(\ln 6x) + x + C$

C) $x(\ln 6x)^2 - 2x(\ln 6x) + C$ D) $x(\ln 6x)^2 - 2x(\ln 6x) + 2x + C$

Solve the problem.

304) Express $\int \tan^9 x\,dx$ in terms of $\int \tan^7 x\,dx$ 304) ______

A) $\int \tan^9 x\,dx = \frac{1}{8}\tan^8 x - \int \tan^7 x\,dx$ B) $\int \tan^9 x\,dx = \frac{1}{9}\tan^7 x - \frac{1}{9}\int \tan^7 x\,dx$

C) $\int \tan^9 x\,dx = \frac{1}{9}\tan^8 x \sec x - \int \tan^7 x\,dx$ D) $\int \tan^9 x\,dx = \frac{1}{8}\tan^8 x + \int \tan^7 x\,dx$

Use Simpson's Rule with n = 4 steps to estimate the integral.

305) $\int_0^1 \frac{8}{1+x}\,dx$ 305) ______

A) $\frac{1171}{315}$ B) $\frac{1171}{210}$ C) $\frac{1747}{630}$ D) $\frac{1747}{315}$

Evaluate the integral.

306) $\int \text{sech}^4\, 9x \tanh 9x\,dx$ 306) ______

A) $-\frac{\text{sech}^4\, 9x}{36} + C$ B) $-\frac{\text{sech}^4\, 9x}{4} + C$

C) $\frac{\text{sech}^4\, 9x \tanh^2 9x}{36} + C$ D) $-\frac{\text{sech}^4\, 9x \tanh 9x}{36} + C$

307) $\int \sec^3(x-9)\tan(x-9)\,dx$ 307) ______

A) $\frac{1}{4}\sec^4(x-9) + C$ B) $\frac{1}{4}\sec^4(9x-9) + C$

C) $\frac{1}{3}\sec^3(x-9) + C$ D) $-\frac{1}{4}\sec^4(x-9) + C$

308) $\int 6\cos^3 3x\,dx$ 308) ______

A) $2\sin 3x + \frac{2}{3}\sin^3 3x + C$ B) $2\sin 3x - \frac{2}{3}\sin^3 3x + C$

C) $2\sin 3x - \frac{2}{3}\cos^3 3x + C$ D) $6\sin 3x - 2\sin^3 3x + C$

Solve the problem.

309) Find an upper bound for the error in estimating $\int_2^4 \frac{1}{x-1}dx$ using Simpson's Rule with n = 4 steps. 309) ______

A) $\frac{1}{29160}$ B) $\frac{1}{60}$ C) $\frac{1}{120}$ D) $\frac{8}{15}$

Evaluate the integral.

310) $\int \frac{dx}{(x-5)\sqrt{x^2-10x+21}}$ 310) ______

A) $\sin^{-1}\left(\frac{x-5}{2}\right)+C$ B) $\sec^{-1}\left|\frac{x-5}{2}\right|+C$

C) $\frac{1}{2}\sec^{-1}\left|\frac{x+5}{2}\right|+C$ D) $\frac{1}{2}\sec^{-1}\left|\frac{x-5}{2}\right|+C$

Solve the problem by integration.

311) The force F (in N) applied by a stamping machine in making a certain computer part is $F=\frac{6x}{x^2+6x+12}$, where x is the distance (in cm) through which the force acts. Find the work done by the force from x = 0 to x = 0.200 cm. 311) ______

A) 0.00227 N• cm B) −0.0609 N• cm C) 0.0136 N• cm D) 12.5 N• cm

Express the integrand as a sum of partial fractions and evaluate the integral.

312) $\int \frac{2x^3+5x^2+14x+7}{(x^2+2x+5)^2}dx$ 312) ______

A) $\ln\left|x^2+2x+5\right| - \frac{1}{x^2+2x+5}+C$

B) $\ln\left|x^2+2x+5\right| - \frac{1}{2}\tan^{-1}\frac{x+1}{2}+C$

C) $-\frac{1}{2}\tan^{-1}\frac{x+1}{2} - \frac{1}{x^2+2x+5}+C$

D) $\ln\left|x^2+2x+5\right| - \frac{1}{2}\tan^{-1}\frac{x+1}{2} - \frac{1}{x^2+2x+5}+C$

Find the area or volume.

313) Find the volume of the solid generated by revolving the area under $y = 7e^{-x}$ in the first quadrant about the y-axis. 313) ______

A) 28π B) 7π C) 1 D) 14π

Evaluate the integral by making a substitution and then using a table of integrals.

314) $\int \tan^{-1}\sqrt{x+2}\,dx$ 314) ______

A) $\frac{1}{2}(x+2)\sin^{-1}\sqrt{x+2} - \sqrt{x+2}+C$

B) $\frac{1}{4}(2x+3)\sin^{-1}\sqrt{x+2} + \frac{\sqrt{x+2}}{4}\sqrt{-x-1}+C$

C) $(x+3)\tan^{-1}\sqrt{x+2} - \sqrt{x+2}+C$

D) $\frac{1}{2}(x+3)\tan^{-1}\sqrt{x+2} - \frac{\sqrt{x+2}}{2}+C$

Use Simpson's Rule with n = 4 steps to estimate the integral.

315) $\int_{-1}^{0} \sin \pi t\,dt$ 315) ______

A) $-\frac{2+\sqrt{2}}{6}$ B) $-\frac{1+2\sqrt{2}}{6}$ C) $-\frac{1+\sqrt{2}}{4}$ D) $-1-2\sqrt{2}$

Evaluate the integral.

316) $\int \frac{\cos t\,dt}{\sin^2 t - 10\sin t + 24}$ 316) ______

A) $\frac{1}{2}\ln|\sin t-6| - \frac{1}{2}\ln|\sin t-4|+C$ B) $\ln|\sin t-6| - \ln|\sin t-4|+C$

C) $\frac{1}{2}\ln|\sin t-6| + \frac{1}{2}\ln|\sin t-4|+C$ D) $\frac{1}{2}\ln|t-6| - \frac{1}{2}\ln|t-4|+C$

Use integration by parts to establish a reduction formula for the integral.

317) $\int \sec^n x\,dx,\ n \neq 1$ 317) ______

A) $\int \sec^n x\,dx = \frac{1}{n}\sec^n x\tan x - \frac{n-1}{n}\int \sec^{n-1} x\,dx$

B) $\int \sec^n x\,dx = \sec^{n-2} x\tan x + (n-2)\int \sec^{n-2} x\,dx$

C) $\int \sec^n x\,dx = \frac{1}{n-1}\sec^{n-2} x\tan x + \frac{n-2}{n-1}\int \sec^{n-2} x\,dx$

D) $\int \sec^n x\,dx = \sec^{n-2} x\tan x - (n-2)\int \sec^{n-2} x\tan x\,dx$

Use Simpson's Rule with n = 4 steps to estimate the integral.

318) $\int_1^3 (8x+3)\,dx$ 318) ______

A) $\frac{95}{3}$ B) 76 C) 38 D) 19

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

319) $\int_0^2 \frac{y\,dy}{(y^2+1)^2}$ 319) ______

y	$y/(y^2+1)^2$
0	0
0.25	0.22145
0.5	0.32
0.75	0.3072
1	0.25
1.25	0.19036
1.5	0.14201
1.75	0.10604
2	0.08

A) S = 0.38151; E_S = 0.01849 B) S = 0.39427; E_S = 0.00574

C) S = 0.60053; E_S = −0.00053 D) S = 0.40035; E_S = −0.00035

Evaluate the integral.

320) $\int \csc\frac{t}{2}\,dt$ 320) ______

A) $-2\ln\left|\csc\frac{t}{2} - \cot\frac{t}{2}\right|+C$ B) $-2\ln\left|\csc\frac{t}{2} + \cot\frac{t}{2}\right|+C$

C) $2\ln\left|\csc\frac{t}{2} + \cot\frac{t}{2}\right|+C$ D) $-\frac{1}{2}\ln\left|\csc\frac{t}{2} + \cot\frac{t}{2}\right|+C$

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

321) $\int_1^4 \frac{\sqrt{x}-1}{\sqrt{x}}dx$ 321) ______

x	$(\sqrt{x}-1)/\sqrt{x}$
1	0
1.375	0.14720
1.75	0.24407
2.125	0.31401
2.5	0.36754
2.875	0.41023
3.25	0.44530
3.625	0.47477
4	0.5

A) S = 0.99492; E_S = 0.00508 B) S = 1.06233; E_S = −0.06233

C) S = 0.99983; E_S = 0.00017 D) S = 0.92750; E_S = 0.07249

Solve the problem.

322) Find the area of the region enclosed by y = 2x sin x and the x-axis for $0 \le x \le \pi$. 322) ______

A) 2π B) π C) 1π D) 4π

Provide the proper response.

323) Given that we know the Fundamental Theorem of Calculus, why would we want to develop numerical methods for definite integrals? 323) ______

i) Antiderivatives are not always expressable in closed form.

ii) Numerical methods are a good excuse to use our graphics calculator.

iii) The function f(x) may not be continuous on [a,b].

A) Only ii is correct. B) Only iii is correct.

C) Only i is correct. D) Both i and iii are correct.

Integrate the function.

324) $\int_0^1 \frac{dx}{\sqrt{64-x^2}}$ 324) ______

A) $\frac{1}{8}\sin^{-1}\frac{1}{8}$ B) $8\cos^{-1}\frac{1}{8}$ C) $\sin^{-1}\frac{1}{8}$ D) $\cos^{-1}\frac{1}{8}$

Use Simpson's Rule with n = 4 steps to estimate the integral.

325) $\int_0^1 \frac{5}{1+x^2}dx$ 325) ______

A) $\frac{5323}{1360}$ B) $\frac{8011}{2040}$ C) $\frac{8011}{1020}$ D) $\frac{5323}{680}$

Determine whether the improper integral converges or diverges.

326) $\int_{-6}^{6} \frac{dx}{(x+1)^{1/3}}$ 326) ______

A) Converges B) Diverges

Solve the problem.

327) Find the length of the curve y = ln (cos x), $0 \le x \le \frac{\pi}{6}$. 327) ______

A) 0.9468 B) 0.5493 C) 2..5774 D) 1.7321

Find the area or volume.

328) Find the area under the curve $y=\frac{1}{(x+1)^{3/2}}$ bounded on the left by x = 24. 328) ______

A) $\frac{2}{5}$ B) $\frac{1}{5}$ C) $\frac{1}{12}$ D) 10

Evaluate the integral.

329) $\int_0^3 x^2 e^{2x}\,dx$ 329) ______

A) 1815.18 B) 100.61 C) 1311.14 D) 1310.89

Integrate the function.

330) $\int \frac{dx}{\sqrt{36x^2-121}},\ x > \frac{11}{6}$ 330) ______

A) $\frac{1}{11}\ln\left|\frac{11}{6}x + \frac{\sqrt{36x^2-121}}{6}\right| + C$
B) $\frac{1}{6}\ln\left|\sec^{-1}\left(\frac{11}{6}x\right) + \frac{\sqrt{36x^2-121}}{11}\right| + C$
C) $\frac{1}{6}\ln\left|\frac{3}{4}x + \frac{11}{\sqrt{36x^2-121}}\right| + C$
D) $\frac{1}{6}\ln\left|\frac{6}{11}x + \frac{\sqrt{36x^2-121}}{11}\right| + C$

Evaluate the integral.

331) $\int_0^{\pi/2} \cos 5t \cos 4t\, dt$ 331) ______

A) $\frac{8}{9}$ B) $\frac{7}{9}$ C) $\frac{5}{9}$ D) $\frac{10}{9}$

Use integration by parts to establish a reduction formula for the integral.

332) $\int x^n e^x\, dx$ 332) ______

A) $\int x^n e^x\, dx = x^n e^x + n\int x^{n-1} e^x\, dx$
B) $\int x^n e^x\, dx = x^n e^x - n\int x^{n+1} e^x\, dx$
C) $\int x^n e^x\, dx = x^n e^x - n\int x^{n-1} e^x\, dx$
D) $\int x^n e^x\, dx = x^n e^x - \frac{1}{n+1}\int x^{n-1} e^x\, dx$

Express the integrand as a sum of partial fractions and evaluate the integral.

333) $\int \frac{8x+27}{x^3+6x^2+9x}\, dx$ 333) ______

A) $3\ln\left|\frac{x}{x+3}\right| - \frac{6}{x+3} + C$
B) $3\ln\left|\frac{x}{x+3}\right| + \frac{5}{x+3} + C$
C) $3\ln\left|\frac{x}{x+3}\right| + \frac{1}{x+3} + C$
D) $2\ln\left|\frac{x}{x+3}\right| - \frac{1}{x+3} + C$

Evaluate the integral by first performing long division on the integrand and then writing the proper fraction as a sum of partial fractions.

334) $\int \frac{7y^4+3y^2-7y}{y^3-1}\, dy$ 334) ______

A) $\frac{7}{2}y^2 + 7\ln|y-1| + \ln|y^2-y+1| + C$
B) $\frac{7}{2}y^2 + \ln|y-1| + \ln|y^2+y+1| + C$
C) $\frac{7}{2}y^2 + \ln|y-1| + (2y+1)\ln|y^2+y+1| + C$
D) $\frac{7}{2}y^2 - \ln|y-1| + 7\ln|y^2+y+1| + C$

Evaluate the integral.

335) $\int \cos\frac{\theta}{2}\cos\frac{\theta}{5}\, d\theta$ 335) ______

A) $\frac{5}{3}\cos\frac{3}{10}\theta + \frac{5}{7}\cos\frac{7}{10}\theta + C$
B) $\frac{5}{3}\sin\frac{3}{10}\theta + \frac{5}{7}\sin\frac{7}{10}\theta + C$
C) $\frac{5}{3}\sin\frac{3}{10}\theta - \frac{5}{7}\sin\frac{7}{10}\theta + C$
D) $\frac{5}{3}\sin 3\theta + \frac{5}{7}\sin 7\theta + C$

Evaluate the integral by using a substitution prior to integration by parts.

336) $\int \cos(\ln x)\, dx$ 336) ______

A) $\frac{x}{2}[\cos(\ln x) + \sin(\ln x)] + C$
B) $x\cos(\ln x) + \sin(\ln x) + C$
C) $\frac{x}{2}[\cos(\ln x) - \sin(\ln x)] + C$
D) $x[\cos(\ln x) + \sin(\ln x)] + C$

Find the surface area or volume.

337) Use numerical integration with a programmable calculator or a CAS to find, to two decimal places, the area of the surface generated by revolving the curve $y = \sin 2x$, $0 \le x \le \frac{\pi}{2}$, about the x-axis. 337) ______

A) 7.21 B) 14.42 C) 1.48 D) 9.29

Evaluate the improper integral.

338) $\int_3^6 \frac{dt}{t\sqrt{t^2-9}}$ 338) ______

A) $\frac{1}{3}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{6}$ D) $\frac{\pi}{9}$

Evaluate the integral.

339) $\int \csc^2 t \cot(\cot t)\, dt$ 339) ______

A) $\ln|\sin(\cot t)| + C$
B) $-\ln|\sin t| + C$
C) $-\ln|\sin(\cot t)| \cdot \cot t + C$
D) $-\ln|\sin(\cot t)| + C$

Solve the problem by integration.

340) The general expression for the slope of a curve is $\frac{3x+4}{x^2+4x}$. Find the equation of the curve if it passes through (1, 0). 340) ______

A) $y = \ln|x(x+4)^2|$
B) $y = \ln\left|\frac{x(x-4)^2}{25}\right|$
C) $y = \ln\left|\frac{x(x+4)^2}{25}\right|$
D) $y = \ln\left|\frac{x(x+4)^2}{5}\right|$

Use a trigonometric substitution to evaluate the integral.

341) $\int_0^2 \frac{4e^{-t}}{1+16e^{-2t}}\, dt$ 341) ______

A) $\tan^{-1}2 - \tan^{-1}4$
B) $\tan^{-1}\frac{4}{e^2} - \tan^{-1}4$
C) $\tan^{-1}4 - \tan^{-1}\frac{4}{e^2}$
D) $\frac{1}{4}\tan^{-1}4 - \frac{1}{4}\tan^{-1}\frac{4}{e^2}$

Evaluate the integral.

342) $\int \sin 6x \cos 4x\, dx$ 342) ______

A) $-\frac{1}{20}\cos 10x - \frac{1}{4}\cos 2x + C$
B) $\frac{1}{4}\sin 2x - \frac{1}{20}\sin 10x + C$
C) $-\frac{1}{20}\cos 10x - \frac{1}{20}\sin 10x + C$
D) $\frac{1}{4}\sin 2x + \frac{1}{20}\sin 10x + C$

343) $\int \frac{dx}{x\sqrt{4-x^2}}$ 343) ______

A) $-\frac{1}{2}\ln\left|\frac{2+\sqrt{4-x^2}}{x}\right| + C$
B) $-\frac{\sqrt{4-x^2}}{4x} + C$
C) $-\frac{1}{2}\ln\left|\frac{x+\sqrt{4-x^2}}{x}\right| + C$
D) $\sqrt{4-x^2} - 2\ln\left|\frac{2+\sqrt{4-x^2}}{x}\right|$

Solve the problem.

344) The charge q (in coulombs) delivered by a current i (in amperes) is given by $q = \int i\, dt$, where t is the time (in seconds). A damped-out periodic wave form has current given by $i = e^{-3t}\cos 5t$. Find a formula for the charge delivered over time t. 344) ______

A) $\frac{e^{-3t}(-3\cos 5t + \sin 5)}{34} + C$
B) $\frac{e^{-3t}(-3\cos 5t + 5\sin 5t)}{34} + C$
C) $\frac{e^{-3t}(-3\cos 5t + 5\sin 5t)}{25} + C$
D) $\frac{-3\cos 5t + 5\sin 5t}{34} + C$

Evaluate the integral.

345) $\int \frac{4e^{2t}-7e^t}{e^{3t}-3e^{2t}+e^t-3}\, dt$ 345) ______

A) $\frac{1}{2}\ln|t-3| - \frac{1}{4}\ln|t+1| + \frac{5}{2}\tan^{-1}t + C$
B) $\frac{1}{2}\ln|e^t-3| - \frac{1}{4}\ln|e^{2t}+1| + \frac{5}{2}\tan^{-1}(e^t) + C$
C) $\frac{1}{4}\ln|e^t-3| + \frac{1}{2}\ln|e^{2t}+1| + \frac{3}{2}\tan^{-1}(e^t) + C$
D) $\frac{1}{2}\ln|e^t-3| - \frac{1}{4}\ln|e^{2t}+1| + C$

Solve the problem.

346) Estimate the minimum number of subintervals needed to approximate the integral $\int_3^4 \frac{1}{(x-1)^2}dx$ with an error of magnitude less than 10^{-4} using the Trapezoidal Rule. 346) ______

A) 8 B) 9 C) 71 D) 18

347) Find an upper bound for the error in estimating $\int_{-1}^5 (2x^3+8x)dx$ using the Trapezoidal Rule with n = 5 steps. 347) ______

A) 108 B) $\frac{216}{5}$ C) 25 D) $\frac{216}{25}$

Evaluate the improper integral.

348) $\int_0^5 \frac{dx}{\sqrt{|x-4|}}$ 348) ______

A) 2 B) −2 C) 6 D) 3

Integrate the function.

349) $\int \frac{1}{t^2\sqrt{5-t^2}}\, dt$ 349) ______

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

Evaluate the integral.

350) $\int \frac{\sqrt{25x^2-16}}{x}\, dx$ 350) ______

A) $\ln\left|x + \sqrt{x^2-16}\right| - \frac{\sqrt{x^2-16}}{x} + C$
B) $\ln\left|x + \sqrt{25x^2-16}\right| - \frac{\sqrt{25x^2-16}}{x} + C$
C) $\sqrt{x^2-16} - 4\sec^{-1}\left|\frac{x}{4}\right| + C$
D) $\sqrt{25x^2-16} - 4\sec^{-1}\left|\frac{5x}{4}\right| + C$

Solve the initial value problem for y as a function of x.

351) $\sqrt{x^2-4}\,\frac{dy}{dx} = 1,\ x > 2,\ y(4) = \ln(2+2\sqrt{3})$ 351) ______

A) $y = \frac{1}{4}\ln\left(\frac{x+2}{x-2}\right) + \ln 2$
B) $y = \ln(x + \sqrt{x^2-4}) + \ln(2+2\sqrt{3}) - \ln(4+2\sqrt{3})$
C) $y = \ln(x + \sqrt{x^2-4}) + \ln(2+2\sqrt{3})$
D) $y = \ln|\sec x + \tan x| + \ln(2+2\sqrt{3})$

Expand the quotient by partial fractions.

352) $\frac{t^4 + t^2 - 9t - 12}{t^4 + 3t^2}$ 352) ______

A) $1 + \frac{3t + 2}{t^2 + 3} - \frac{4}{t^2}$ B) $1 + \frac{3t + 2}{t^2 + 3} + \frac{3}{t} - \frac{4}{t^2}$

C) $1 + \frac{3t + 2}{t^2 + 3} - \frac{3}{t} - \frac{4}{t^2}$ D) $1 + \frac{2}{t^2 + 3} - \frac{3}{t} - \frac{4}{t^2}$

Evaluate the integral.

353) $\int (4 \csc t - \cot t)^2 \, dt$ 353) ______

A) $-17 \cot t - 8 \csc t + C$ B) $-17 \cot t + 8 \csc t - t + C$

C) $-16 \cot t + 8 \csc t + \ln|\sin t| + C$ D) $15 \cot t + 8 \csc t + \tan t + C$

Evaluate the improper integral or state that it is divergent.

354) $\int_{-\infty}^{e} 20e^{-x} \, dx$ 354) ______

A) -20 B) 40 C) Divergent D) 20

Solve the problem.

355) Find the area of the region bounded by $y = \sin 2x$ and $y = \cos x$ for $-\frac{\pi}{2} \le x \le \frac{\pi}{6}$. 355) ______

A) 3 B) 2.75 C) $\frac{3\pi}{4}$ D) 2.25

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

356) $\int_{1}^{2} (1 - 2t)^3 \, dt$ 356) ______

t	$(1 - 2t)^3$
1	−1
1.125	−1.95313
1.25	−3.375
1.375	−5.35938
1.5	−8
1.625	−11.39063
1.75	−15.625
1.875	−20.79688
2	−27

A) $S = -10.06250$; $E_S = 0.06250$ B) $S = -10.12500$; $E_S = 0.12500$

C) $S = -8.95833$; $E_S = -1.04167$ D) $S = -10.00000$; $E_S = 0.00000$

Find the surface area or volume.

357) The region between the curve $y = \sin x$, $0 \le x \le 1.5$, and the x-axis is revolved about the x-axis to generate a solid. Use a table of integrals to find, to two decimal places, the volume of the solid generated. 357) ______

A) 2.25 B) 2.14 C) 2.29 D) 2.37

Expand the quotient by partial fractions.

358) $\frac{x + 4}{(x + 1)^2}$ 358) ______

A) $\frac{3}{x + 1} + \frac{1}{(x + 1)^2}$ B) $\frac{1}{x + 1} - \frac{3}{(x + 1)^2}$

C) $\frac{1}{x + 1} + \frac{3}{(x + 1)^2}$ D) $\frac{1}{x + 1} + \frac{4}{x + 4}$

Evaluate the integral.

359) $\int \frac{21e^{\sqrt{7x}}}{2\sqrt{x}} \, dx$ 359) ______

A) $21 e^{\sqrt{7x}} + C$ B) $3\sqrt{7} e^{\sqrt{7x}} + C$ C) $\sqrt{7} e^{\sqrt{7x}} + C$ D) $\frac{21}{2} e^{\sqrt{7x}} + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

360) $\int \frac{5x^2 + x + 100}{x^3 + 25x} \, dx$ 360) ______

A) $4 \ln|x| - \frac{1}{2} \ln|x^2 + 25| - \tan^{-1} x + C$ B) $4 \ln|x| + \frac{1}{2} \ln|x^2 + 25| + \frac{1}{5} \tan^{-1} \frac{x}{5} + C$

C) $4 \ln|x| + \frac{1}{2} \ln|x^2 + 25| + \sin^{-1} \frac{x}{5} + C$ D) $\ln|x| + \frac{1}{2} \ln|x^2 + 25| + \tan^{-1} \frac{x}{5} + C$

Solve the problem.

361) The growth rate of a certain tree (in feet) is given by 361) ______

$$y = \frac{2}{t + 1} + e^{-t^2/2},$$

where t is time in years. Estimate the total growth of the tree through the end of the second year by using Simpson's rule. Use 2 subintervals.

A) 2.34 feet B) 3.68 feet C) 3.41 feet D) 5.11 feet

Evaluate the integral.

362) $\int x^2 5^{-x} \, dx$ 362) ______

A) $-\frac{x^2(5^{-x})}{\ln 5} + \frac{2x(5^{-x})}{\ln^2 5} + \frac{2(5^{-x})}{\ln^3 5} + C$ B) $-\frac{x^2(5^{-x})}{\ln 5} - \frac{2x(5^{-x})}{\ln^2 5} - \frac{2(5^{-x})}{\ln^3 5} + C$

C) $-x^2(5^{-x}) - 2x(5^{-x}) - 2(5^{-x}) + C$ D) $-\frac{x^2(5^{-x})}{\ln 5} + \frac{2x(5^{-x})}{\ln^2 5} - \frac{(5^{-x})}{\ln^3 5} + C$

Evaluate the integral by multiplying by a form of 1 and using a substitution (if necessary) to reduce it to standard form.

363) $\int \frac{\sin x}{1 - \cos x} \, dx$ 363) ______

A) $-\ln|\csc x + \cot x| - \csc^2 x + C$ B) $\csc x + \cot x + C$

C) $\ln|\csc x + \cot x| - \ln|\cos x| + C$ D) $-\ln|\csc x + \cot x| + \ln|\sin x| + C$

Evaluate the integral.

364) $\int \frac{\cos(\ln x - 6)}{x} \, dx$ 364) ______

A) $\frac{1}{2} \cos^2 (\ln x - 6) + C$ B) $\sin(\ln x - 6) \cdot \ln x + C$

C) $-\sin(\ln x - 6) + C$ D) $\sin(\ln x - 6) + C$

Use your calculator to approximate the integral using the method indicated.

365) Trapezoidal Rule, $\int_{0}^{1} \sqrt{x + 4} \, dx$, n = 100 365) ______

A) 2.1936 B) 2.1202 C) 2.1848 D) 2.1607

366) Trapezoidal Rule, $\int_{0}^{2} e^x \, dx$, n = 100 366) ______

A) 7.3891 B) 6.3344 C) 6.3893 D) 6.3895

Evaluate the integral.

367) $\int \frac{dx}{x\sqrt{36x^2 - 2}}$ 367) ______

A) $\frac{\sqrt{2}}{2} \sec^{-1} |3\sqrt{2} x| + C$ B) $\frac{1}{6} \sec^{-1} |6x| + C$

C) $\frac{\sqrt{2}}{2} \sin^{-1} 3\sqrt{2} x + C$ D) $\frac{1}{6} \sec^{-1} |6x - 2| + C$

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

368) $\int_{0}^{\pi} \frac{\sin t}{(2 - \cos t)^2} \, dt$ 368) ______

t	$\sin t/(2 - \cos t)^2$
0	0
0.39270	0.33046
0.78540	0.42302
1.17810	0.35320
1.57080	0.25
1.96350	0.16273
2.35619	0.09649
2.74889	0.04476
3.14159	0

A) $S = 0.65214$; $E_S = 0.01453$ B) $S = 0.63622$; $E_S = 0.03045$

C) $S = 0.67216$; $E_S = -0.00549$ D) $S = 0.66806$; $E_S = -0.00140$

Determine whether the improper integral converges or diverges.

369) $\int_{0}^{2} \frac{dx}{4 - x^2}$ 369) ______

A) Diverges B) Converges

Evaluate the improper integral or state that it is divergent.

370) $\int_{0}^{\infty} 6xe^{2x} \, dx$ 370) ______

A) 1.3333 B) 2.6667 C) 1.6667 D) Divergent

Integrate the function.

371) $\int \frac{x^2}{(x^2 - 4)^{5/2}} \, dt$ 371) ______

A) $-\frac{x^3}{12(x^2 - 4)^{3/2}} + C$ B) $-\frac{x}{6(x^2 - 4)^{5/2}} + C$

C) $-\frac{x^3}{12(x^2 - 4)^{1/2}} + C$ D) $-\frac{x^2}{6(x^2 - 4)^{3/2}} + C$

Determine whether the improper integral converges or diverges.

372) $\int_{1}^{\infty} \frac{6}{\sqrt{x^2 + 9}}$ 372) ______

A) Converges B) Diverges

Integrate the function.

373) $\int \frac{dx}{(x^2 + 25)^{3/2}}$ 373) ______

A) $\frac{x}{5\sqrt{25 + x^2}} + C$ B) $\frac{x}{25\sqrt{25 - x^2}} + \frac{\sqrt{25 - x^2}}{x} + C$

C) $\frac{5}{x\sqrt{25 - x^2}} + C$ D) $\frac{x}{25\sqrt{25 + x^2}} + C$

Evaluate the integral by using trigonometric identities and substitutions to reduce it to standard form.

374) $\int \frac{2\tan x}{\tan 2x} \, dx$ 374) ______

A) $-2\sec x \tan x + C$ B) $2x - \tan x + C$ C) $\tan x + C$ D) $x + C$

375) $\int (\csc x + \cot x)^2 \, dx$ 375) ______

A) $2\csc^2 x + 2\csc x \cot x - x + C$ B) $-2\cot x - x + C$

C) $-2\cot x - 2\csc x - x + C$ D) $-2\csc x + x + C$

Evaluate the integral.

376) $\int x \sin^{-1} x \, dx$ 376) ______

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

Use the substitution z = tan (x/2) to evaluate the integral.

377) $\int \frac{dx}{(1 - \cos x)^2}$ 377) ______

A) $\tan \frac{x}{2} + \frac{1}{3} \tan^3 \frac{x}{2} + C$
B) $2\tan \frac{x}{2} - 2\cot \frac{x}{2} + C$
C) $\tan \frac{x}{2} - \cot \frac{x}{2} + C$
D) $-\frac{1}{6} \cot^3 \frac{x}{2} - \frac{1}{2} \cot \frac{x}{2} + C$

Evaluate the improper integral.

378) $\int_0^1 \frac{dx}{\sqrt{1 - x}}$ 378) ______

A) 2 B) 0 C) 1 D) −2

Find the centroid.

379) Find the centroid of the region bounded by the graphs of $x = \frac{\pi}{3}$, $x = \frac{\pi}{2}$, $y = 0.5$ and $y = \cos x$ 379) ______

A) $(\bar{X}, \bar{Y}) = (1.40916, 0.33333)$
B) $(\bar{X}, \bar{Y}) = (1.30900, 0.31917)$
C) $(\bar{X}, \bar{Y}) = (1.36511, 0.35167)$
D) $(\bar{X}, \bar{Y}) = (1.39877, 0.33486)$

Evaluate the integral.

380) $\int \frac{(x + 5)^2 \tan^{-1} 4x + (16x^3 + x)}{(16x^2 + 1)(x + 5)^2} dx$ 380) ______

A) $\frac{(\tan^{-1} 4x)^2}{2} + \ln|x + 5| - 5(x + 5)^{-1} + C$
B) $\frac{(\tan^{-1} 4x)^2}{8} + \ln|x + 5| + 5(x + 5)^{-1} + C$
C) $\frac{(\tan^{-1} 4x)^2}{8} + 5(x + 5)^{-1} + C$
D) $(x + 5)^2 \tan^{-1} 4x + \ln|x + 5| + 5(x + 5)^{-1} + C$

Determine whether the improper integral converges or diverges.

381) $\int_0^{\ln 10} x^{-3} e^{1/x^2} dx$ 381) ______

A) Converges B) Diverges

Integrate the function.

382) $\int \frac{dx}{x^2\sqrt{x^2 - 36}}, x > 6$ 382) ______

A) $\frac{216}{x} + C$
B) $\ln\left|\frac{x}{6} + \frac{\sqrt{x^2 - 36}}{x}\right| + C$
C) $\ln\left|x + \sqrt{x^2 - 36}\right| + C$
D) $\frac{1}{36} \frac{\sqrt{x^2 - 36}}{x} + C$

Evaluate the integral by using trigonometric identities and substitutions to reduce it to standard form.

383) $\int (\sin x + \cos x)^2 dx$ 383) ______

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

Evaluate the integral by separating the fraction and using a substitution if necessary.

384) $\int \frac{2x + 5}{\sqrt{36 - x^2}} dx$ 384) ______

A) $-\frac{1}{2}\sqrt{36 - x^2} - 5\sin^{-1}\left(\frac{x}{6}\right) + C$
B) $\sqrt{36 - x^2} + \sin^{-1}\left(\frac{x}{36}\right) + C$
C) $2\sqrt{36 - x^2} + 5\tan^{-1}\left(\frac{x}{6}\right) + C$
D) $-2\sqrt{36 - x^2} + 5\sin^{-1}\left(\frac{x}{6}\right) + C$

Solve the problem.

385) Find the average value of the function $y = \frac{28}{\sqrt{36 - 49x^2}}$ over the interval from $x = 0$ to $x = \frac{3}{7}$. 385) ______

A) $\frac{1}{3}\pi$ B) $\frac{14}{9}\pi$ C) $\frac{2}{9}\pi$ D) $\frac{2}{3}\pi$

Evaluate the integral by first performing long division on the integrand and then writing the proper fraction as a sum of partial fractions.

386) $\int \frac{6x^4 + 12x^2 + 2}{x^3 + 2x} dx$ 386) ______

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

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

387) $\int_0^1 x(1 + x^2)^2 dx$ 387) ______

x	$x(1 + x^2)^2$
0	0
0.125	0.12894
0.25	0.28223
0.375	0.48788
0.5	0.78125
0.625	1.20865
0.75	1.83105
0.875	2.72775
1	4

A) $T = 1.43097$; $E_T = -0.26430$
B) $T = 1.16675$; $E_T = -0.00008$
C) $T = 2.36194$; $E_T = -0.02861$
D) $T = 1.18097$; $E_T = -0.01430$

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

388) $\int_{-1}^0 \sin \pi t \, dt$ 388) ______

A) $-1 - \sqrt{2}$ B) $-\frac{1 + \sqrt{2}}{2}$ C) $-\frac{1 + \sqrt{2}}{8}$ D) $-\frac{1 + \sqrt{2}}{4}$

Evaluate the integral by separating the fraction and using a substitution if necessary.

389) $\int_0^{7/2} \frac{8x + 1}{4x^2 + 49} dx$ 389) ______

A) $\ln 2 - \frac{\pi}{4}$ B) $\ln 2 + \frac{\pi}{56}$ C) $\ln 2 + \frac{\pi}{3}$ D) $\ln 49 + \frac{\pi}{4}$

Evaluate the integral.

390) $\int_0^{1/2} \frac{x \, dx}{\sqrt{64 - x^4}}$ 390) ______

A) $\sin^{-1} \frac{1}{32}$
B) $\frac{1}{2} \sin^{-1} \frac{1}{32} - \frac{1}{2} \sin^{-1} \frac{1}{2}$
C) $\frac{1}{2} \sin^{-1} \frac{1}{64}$
D) $\frac{1}{2} \sin^{-1} \frac{1}{32}$

391) $\int \frac{x \, dx}{1 + 36x^4}$ 391) ______

A) $\frac{1}{12} x \tan^{-1} 6x^2 + C$
B) $\frac{1}{12} \tan^{-1} 6x + C$
C) $\frac{1}{12} \tan^{-1} 6x^2 + C$
D) $\frac{1}{36} \tan^{-1} 36x^2 + C$

392) $\int 7 \cos^3 3x \, dx$ 392) ______

A) $7 \sin 3x - \frac{7}{3} \sin^3 3x + C$
B) $\frac{7}{3} \sin 3x - \frac{7}{9} \cos^3 3x + C$
C) $\frac{7}{3} \sin 3x + \frac{7}{9} \sin^3 3x + C$
D) $\frac{7}{3} \sin 3x - \frac{7}{9} \sin^3 3x + C$

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

393) $\int_0^{\pi/4} \sec^2 \theta \sqrt{\tan \theta} \, d\theta$ 393) ______

θ	$\sec^2\theta \sqrt{\tan \theta}$
0	0
0.09817	0.31688
0.19635	0.46364
0.29452	0.60145
0.39270	0.75402
0.49087	0.93998
0.58905	1.18237
0.68722	1.51606
0.78540	2.0

A) $T = 0.66508$; $E_T = 0.00159$
B) $T = 1.33015$; $E_T = -0.33015$
C) $T = 0.66424$; $E_T = 0.00243$
D) $T = 0.76325$; $E_T = -0.09658$

Solve the problem.

394) Find the volume generated by revolving the curve $y = \cos 3x$ about the x-axis, $0 \le x \le \pi/36$ 394) ______

A) $\frac{\pi^2}{72} + \frac{\pi}{36}$ B) $\frac{\pi^2}{72} + \frac{\pi}{24}$ C) $\frac{\pi^2}{72}$ D) $\frac{\pi}{72} + \frac{1}{24}$

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

395) $\int_{\pi/8}^{\pi/4} \csc^2 2\theta \, d\theta$ 395) ______

θ	$\csc^2 2\theta$
0.39270	2
0.44179	1.67351
0.49087	1.44646
0.53996	1.28570
0.58905	1.17157
0.63814	1.09202
0.68722	1.03957
0.73631	1.00970
0.78540	1

A) $S = 0.50002$; $E_S = -0.00002$
B) $S = 0.49986$; $E_S = 0.00014$
C) $S = 0.50160$; $E_S = -0.00160$
D) $S = 0.52614$; $E_S = -0.02614$

Solve the problem by integration.

396) Find the x-coordinate of the centroid of the area bounded by $y(x^2 - 36) = 1$, $y = 0$, $x = 7$, and $x = 9$. 396) ______

A) 1.30 B) −2.05 C) 2.05 D) 7.80

Evaluate the integral.

397) $\int \frac{\cot^3 x}{7} dx$ 397) ______

A) $\frac{1}{28}\cot^4 x + C$

B) $\frac{1}{14}\cot^2 x + \ln|\sin x| + C$

C) $-\frac{1}{14}\cot^2 x - \frac{1}{7}\ln|\sin x| + C$

D) $\frac{1}{28}\cot^4 x \sec x + C$

Solve the problem.

398) Find the area of the region bounded by $y = \csc^2 x$ and $y = \sin x$, $\frac{\pi}{4} \le x \le \frac{3\pi}{8}$, and on the left by the line $x = \frac{\pi}{4}$. 398) ______

A) 0.9102 B) 0.2614 C) 0.8026 D) 0.3690

Evaluate the improper integral or state that it is divergent.

399) $\int_0^{\infty} 8e^{-8x}\, dx$ 399) ______

A) −1 B) 1 C) Divergent D) 0

Solve the problem.

400) Find the length of the curve $y = \ln(\sin x)$, $\pi/6 \le x \le \pi/2$ 400) ______

A) $1 - \ln(\sqrt{3} + 2)$ B) $\ln(\sqrt{3})$ C) $\ln(\sqrt{3} + 1)$ D) $\ln(\sqrt{3} + 2)$

Evaluate the integral.

401) $\int \frac{\cos(\ln x - 8)}{x} dx$ 401) ______

A) $\sin(\ln x - 8) + C$

B) $\frac{\sin(\ln x - 8)}{x} + C$

C) $\frac{1}{2}\cos^2(\ln x - 8) + C$

D) $-\sin(\ln x - 8) + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

402) $\int_3^5 \frac{3x\ dx}{(x-8)^3}$ 402) ______

A) $\frac{34}{75}$ B) $-\frac{34}{225}$ C) $-\frac{16}{75}$ D) $-\frac{34}{75}$

Solve the problem.

403) Find the length of the curve $y = \ln(\sin x)$, $\frac{\pi}{4} \le x \le \frac{\pi}{3}$. 403) ______

A) 0.8814 B) 1.4307 C) 0.5493 D) 0.3321

Determine whether the improper integral converges or diverges.

404) $\int_2^{\infty} \frac{15}{(x+1)^2} dx$ 404) ______

A) Diverges B) Converges

Evaluate the integral.

405) $\int 2\sinh^5 9x\, dx$ 405) ______

A) $\frac{2}{45}\cosh^4 9x \sinh 9x - \frac{8}{45}\cosh^2 9x \sinh 9x + \frac{16}{45}\cosh 9x + C$

B) $\frac{2}{45}\sinh^4 9x \cosh 9x - \frac{2}{45}\sinh^2 9x \cosh 9x + \frac{2}{45}\cosh 9x + C$

C) $\frac{2}{45}\sinh^4 9x \cosh 9x + \frac{8}{135}\sinh^2 9x \cosh 9x + \frac{16}{135}\cosh 9x + C$

D) $\frac{2}{45}\sinh^4 9x \cosh 9x - \frac{8}{135}\sinh^2 9x \cosh 9x + \frac{16}{135}\cosh 9x + C$

Determine whether the improper integral converges or diverges.

406) $\int_1^{\infty} \frac{\sqrt{5x+9}}{x^2}$ 406) ______

A) Diverges B) Converges

Evaluate the integral.

407) $\int \frac{(x+5)^2 \tan^{-1} x + (2x - 16)(x+5)}{(x^2+1)(x+5)^2} dx$ 407) ______

A) $\frac{(\tan^{-1}x)^2}{2} - 3\tan^{-1} x + \frac{1}{2}\ln(x^2+1) + C$

B) $\frac{(\tan^{-1}x)^2}{2} - \ln|x+5| - 3\tan^{-1} x + \frac{1}{2}\ln(x^2+1) + C$

C) $\frac{(\tan^{-1}x)^2}{2} - \ln|x+5| - 5\tan^{-1} x + \ln(x^2+1) + C$

D) $\frac{(\tan^{-1}x)^2}{2} - \ln|x+5| + \frac{1}{2}\ln(x^2+1) + C$

Integrate the function.

408) $\int \frac{dx}{x\sqrt{36x^2 - 4}}$ 408) ______

A) $\frac{1}{2}\sec^{-1} 3x + C$ B) $\frac{1}{6}\sin^{-1} 3x + C$ C) $3\sec^{-1} 3x + C$ D) $3\sin^{-1} 3x + C$

Find the area or volume.

409) Find the volume of the solid generated by revolving the area under $y = 7e^{-x}$ in the first quadrant about the x-axis 409) ______

A) 49π B) 7π C) 98π D) $\frac{49}{2}\pi$

Integrate the function.

410) $\int \frac{dx}{(16x^2+1)^2}$ 410) ______

A) $\frac{1}{8}\tan^{-1} 4x + \frac{x}{32x^2+2} + C$

B) $\tan^{-1} 4x - \frac{4x}{16x^2+1} + C$

C) $\ln\left|\sqrt{16x^2+1} + 4x\right| + C$

D) $\frac{4x}{16x^2+1} + C$

Solve the problem.

411) During each cycle, the velocity v (in ft/s) of a robotic welding device is given by $v = 2t - \frac{9}{4+t^2}$, where t is the time (in s). Find the expression for the displacement s (in ft) as a function of t if $s = 0$ for $t = 0$. 411) ______

A) $s = t^2 - \frac{9}{2}\tan^{-1}\left(\frac{9}{2}t\right)$

B) $s = t^2 - 9\tan^{-1}\left(\frac{t}{2}\right)$

C) $s = t^2 - 9\sin^{-1}\left(\frac{t}{2}\right)$

D) $s = t^2 - \frac{9}{2}\tan^{-1}\left(\frac{t}{2}\right)$

Expand the quotient by partial fractions.

412) $\frac{6z}{z^3 - 2z^2 - 8z}$ 412) ______

A) $\frac{1}{z-4} - \frac{1}{z+2}$

B) $\frac{1}{z} + \frac{1}{z-4} - \frac{1}{z+2}$

C) $\frac{1}{z-4} + \frac{1}{z+2}$

D) $\frac{1}{z} - \frac{1}{z-4} + \frac{1}{z+2}$

Evaluate the integral by first performing long division on the integrand and then writing the proper fraction as a sum of partial fractions.

413) $\int \frac{x^3}{x^2 + 8x + 16} dx$ 413) ______

A) $\frac{x^2}{2} - 8x + 12\ln|x+4| - \frac{16}{x+4} + C$

B) $\frac{x^2}{2} - 8x + 48\ln|x+4| + \frac{64}{x+4} + C$

C) $48\ln|x-8| + \frac{48}{x+4} - \frac{64}{(x+4)^2} + C$

D) $\frac{x^2}{2} - 8x - 48\ln|x+4| + \frac{64}{(x+4)^2} + C$

Evaluate the integral.

414) $\int \frac{dx}{x\sqrt{4+3x}}$ 414) ______

A) $2\sqrt{4+3x} + 2\sqrt{4}\tan^{-1}\sqrt{\frac{4+3x}{4}} + C$

B) $\frac{1}{\sqrt{4}}\tan^{-1}\sqrt{\frac{4+3x}{4}} + C$

C) $\frac{1}{\sqrt{4}}\ln\left|\frac{\sqrt{4+3x}+\sqrt{4}}{\sqrt{4+3x}-\sqrt{4}}\right| + C$

D) $\frac{1}{\sqrt{4}}\ln\left|\frac{\sqrt{4+3x}-\sqrt{4}}{\sqrt{4+3x}+\sqrt{4}}\right| + C$

Find the surface area or volume.

415) Use an integral table and a calculator to find to two decimal places the area of the surface generated by revolving the curve $y = x^2$, $0 \le x \le 3$, about the x-axis. 415) ______

A) 261.22 B) 186.25 C) 319.29 D) 372.51

Evaluate the integral.

416) $\int_0^{\infty} e^{-x}\cos 3x\, dx$ 416) ______

A) 1 B) $\frac{1}{10}$ C) Diverges D) $\frac{3}{10}$

417) $\int e^{2x} x^2\, dx$ 417) ______

A) $(1/2)x^2e^{2x} - xe^{2x} + (1/4)e^{2x} + C$

B) $(1/2)x^2e^{2x} - (1/2)xe^{2x} + C$

C) $(1/2)x^2e^{2x} - (1/2)xe^{2x} + (1/4)e^{2x} + C$

D) $(1/2)x^2e^{2x} - (1/4)xe^{2x} + (1/4)e^{2x} + C$

Integrate the function.

418) $\int \frac{20\, dx}{x^2\sqrt{x^2+16}}$ 418) ______

A) $\frac{4\sqrt{x^2+16}}{5x} + C$

B) $-\frac{\sqrt{x^2+16}}{5x} + C$

C) $-\frac{5\sqrt{x^2+16}}{4x} + C$

D) $\frac{5\sqrt{x^2+16}}{4x} + C$

Find the area or volume.

419) Find the area of the region in the first quadrant between the curve $y = e^{-4x}$ and the x-axis. 419) ______

A) 1 B) $\frac{1}{4}e$ C) 4 D) $\frac{1}{4}$

420) Find the area of the region bounded by the curve $y = 7x^{-2}$, the x-axis, and on the left by $x = 1$. 420) ______

A) 7 B) 49 C) $\frac{7}{2}$ D) 14

Evaluate the integral.

421) $\int_0^{\infty} e^{-4x}\sin x\, dx$ 421) ______

A) Diverges B) $\frac{4}{17}$ C) 1 D) $\frac{1}{17}$

422) $\int \cos^{-1} x\, dx$ 422) ______

A) $x\cos^{-1}x - 2\sqrt{1-x^2} + C$

B) $x\cos^{-1}x + \sqrt{1-x^2} + C$

C) $x\cos^{-1}x - \frac{1}{\sqrt{1-x^2}} + C$

D) $x\cos^{-1}x - \sqrt{1-x^2} + C$

Evaluate the improper integral.

423) $\int_0^5 \frac{x}{\sqrt{25 - x^2}} dx$ 423) ______

A) 25 B) −5 C) 5 D) −25

Find the area or volume.

424) Find the volume of the solid generated by revolving the region under the curve $y = \frac{9}{x}$, from x = 1 to x = ∞, about the x-axis. 424) ______

A) 9π B) $\frac{1}{9}\pi$ C) 9 D) 18π

Evaluate the integral.

425) $\int (\sec u \tan u)\, 2^{\sec u}\, du$ 425) ______

A) $\frac{\tan u\, 2^{\sec u}}{\ln 2} + C$ B) $\frac{2^{\sec u} \tan u}{\ln 2} + C$

C) $\frac{2^{\sec u}}{\ln 2} + C$ D) $2^{\sec u} + C$

Solve the problem.

426) The rate of water usage for a business, in gallons per hour, is given by $W(t) = 16te^{-t}$, where t is the number of hours since midnight. Find the average rate of water usage over the interval $0 \le t \le 5$. 426) ______

A) 0.13 gallons per hour B) 3.33 gallons per hour

C) 3.07 gallons per hour D) 3.11 gallons per hour

Determine whether the improper integral converges or diverges.

427) $\int_{-\infty}^{\infty} \frac{dx}{\sqrt{5x^6 + 1}}$ 427) ______

A) Diverges B) Converges

Use integration by parts to establish a reduction formula for the integral.

428) $\int \cot^n x\, dx,\ n \ne 1$ 428) ______

A) $\int \cot^n x\, dx = \frac{1}{n-1} \cot^{n-1} x + \int \cot^{n-1} x\, dx$

B) $\int \cot^n x\, dx = -\cot^{n-1} x + \frac{1}{n-1} \int \cot^{n-2} x\, dx$

C) $\int \cot^n x\, dx = \frac{-1}{n-1} \cot^{n-2} x - \int \cot^{n-1} x\, dx$

D) $\int \cot^n x\, dx = \frac{-1}{n-1} \cot^{n-1} x - \int \cot^{n-2} x\, dx$

Evaluate the integral.

429) $\int \sin 8t \sin 2t\, dt$ 429) ______

A) $\frac{1}{12} \sin 6t - \frac{1}{20} \cos 10t + C$ B) $\frac{1}{12} \sin 6t - \frac{1}{20} \sin 10t + C$

C) $\frac{1}{12} \sin 8t - \frac{1}{20} \sin 2t + C$ D) $\frac{1}{12} \sin 6t + \frac{1}{20} \sin 10t + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

430) $\int \frac{8x - 12}{x^2 - 3x - 4} dx$ 430) ______

A) $\ln|4(x - 4) + 4(x + 1)| + C$ B) $5\ln|x - 4| - 4\ln|x + 1| + C$

C) $4\ln|x - 4| + 4\ln|x + 1| + C$ D) $4\ln|x + 4| + 4\ln|x - 1| + C$

Evaluate the integral.

431) $\int x^2 \cosh 5x\, dx$ 431) ______

A) $\frac{x^2}{5} \sinh 5x - \frac{2}{25} x \cosh 5x + \frac{2}{125} \sinh 5x + C$

B) $\frac{x^2}{5} \sinh 5x - \frac{2}{25} x^2 \cosh 5x + \frac{2}{125} x \sinh 5x + C$

C) $\frac{x^2}{5} \sinh 5x - \frac{2}{25} x \sinh 5x + \frac{2}{125} \cosh 5x + C$

D) $\frac{x^2}{5} \sinh 5x - \frac{2}{25} x \cosh 5x - \frac{2}{25} \sinh 5x + C$

Solve the problem by integration.

432) The slope of a curve is given by $\frac{dy}{dx} = \frac{30x^2 + 50}{9x^4 + 25x^2}$. Find the equation of the curve if it passes through $\left(\frac{5}{3}, 3\right)$. 432) ______

A) $y = \frac{2}{x} + \frac{4}{5}\tan^{-1}\left(\frac{3}{5}x\right) - \frac{21}{5} - \frac{1}{5}\pi$ B) $y = \frac{2}{x} - \frac{4}{5}\tan^{-1}\left(\frac{3}{5}x\right) - \frac{21}{5} + \frac{2}{15}\pi$

C) $y = -\frac{2}{x} + \frac{4}{5}\tan^{-1}\left(\frac{3}{5}x\right) + \frac{21}{5} - \frac{2}{15}\pi$ D) $y = -\frac{2}{x} + \frac{4}{5}\tan^{-1}\left(\frac{3}{5}x\right) + \frac{21}{5} - \frac{1}{5}\pi$

Find the area or volume.

433) Find the volume of the solid generated by revolving the region under the curve $y = 6e^{-x^2}$ in the first quadrant about the y-axis. 433) ______

A) $6\pi^3$ B) 6π C) 3π D) 36π

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

434) $\int_0^1 x\sqrt{x^2 + 2}\, dx$ 434) ______

x	$x\sqrt{x^2+2}$
0	0
0.125	0.17747
0.25	0.35904
0.375	0.54866
0.5	0.75
0.625	0.96635
0.75	1.20059
0.875	1.45514
1	1.73205

A) T = 0.89866; E_T = −0.10942 B) T = 1.58082; E_T = −0.00234

C) T = 0.79041; E_T = −0.00117 D) T = 0.78924; E_T = 0.00001

Use your calculator to approximate the integral using the method indicated.

435) Simpson's Rule, $\int_1^2 x \ln x\, dx$, n = 100 435) ______

A) 0.6826 B) 0.6265 C) 0.6687 D) 0.6363

Evaluate the integral.

436) $\int \frac{8\, dx}{\sqrt{9 - 64x^2}}$ 436) ______

A) $\frac{1}{3}\tan^{-1}\left(\frac{8}{3}x\right) + C$ B) $\tan^{-1}\left(\frac{8}{3}x\right) + C$

C) $\frac{1}{3}\sin^{-1}\left(\frac{8}{3}x\right) + C$ D) $\sin^{-1}\left(\frac{8}{3}x\right) + C$

437) $\int 7pe^{5p^2}\, dp$ 437) ______

A) $-\frac{7}{5} e^{5p^2} + C$ B) $-7e^{5p^2} + C$ C) $\frac{7}{10} e^{5p^2} + C$ D) $7e^{5p^2} + C$

Determine whether the improper integral converges or diverges.

438) $\int_0^6 (x - 5)^{-4/3}\, dx$ 438) ______

A) Diverges B) Converges

Evaluate the integral by multiplying by a form of 1 and using a substitution (if necessary) to reduce it to standard form.

439) $\int \frac{1}{1 - \cos x} dx$ 439) ______

A) $\tan x - \sec x + C$ B) $\cot x + \csc x + C$

C) $-\tan x + \sec x + C$ D) $-\cot x - \csc x + C$

Solve the problem.

440) Find the area bounded by $y(4 + 36x^2) = 6$, x = 0, y = 0, and x = 5. 440) ______

A) $\sin^{-1}(15)$ B) $6 \sin^{-1}(15)$ C) $\frac{1}{2}\tan^{-1}\left(\frac{5}{2}\right)$ D) $\frac{1}{2}\tan^{-1}(15)$

Evaluate the integral.

441) $\int \frac{5e^{4t} + 25e^{2t} + 5}{e^{2t} + 5} dt$ 441) ______

A) $\frac{5}{2}e^{2t} + t - \frac{1}{2}\ln|e^{2t} + 5| + C$ B) $e^{2t} + t - \frac{1}{2}\ln|e^t + 5| + C$

C) $e^{2t} + \ln|e^t + 5| - \frac{1}{2}\ln|e^{2t}| + C$ D) $\frac{5}{2}e^{2t} - t + \ln|e^{2t} + 5| + C$

Solve the initial value problem for x as a function of t.

442) $(t^2 - 11t + 30)\frac{dx}{dt} = 1 \quad (t > 6),\ x(7) = 0$ 442) ______

A) $x = -\ln|t - 5| + \ln|t - 6| + 2$ B) $x = \ln|t - 5| - \ln|t - 6| + \ln 2$

C) $x = -\ln|t - 5| + \frac{1}{t - 6} + \ln 2$ D) $x = -\ln|t - 5| + \ln|t - 6| + \ln 2$

Evaluate the integral by using trigonometric identities and substitutions to reduce it to standard form.

443) $\int (\tan x + \cot x)^2\, dx$ 443) ______

A) $\tan x - \cot x + 4x + C$ B) $-\tan x + \cot x + 4x + C$

C) $\tan x - \cot x + C$ D) $-\tan x + \cot x + C$

Use the substitution z = tan (x/2) to evaluate the integral.

444) $\int \frac{dx}{16 - \cos x}$ 444) ______

A) $-\frac{2\sqrt{255}}{255}\tan^{-1}\left[\frac{\sqrt{255}}{17}\tan\left(\frac{x}{2}\right)\right] + C$ B) $\frac{1}{16}\tan\left(\frac{x}{2}\right) + C$

C) $\frac{2\sqrt{255}}{255}\tan^{-1}\left[\frac{\sqrt{255}}{15}\tan\left(\frac{x}{2}\right)\right] + C$ D) $\frac{2\sqrt{255}}{255}\tan^{-1}\left[\frac{\sqrt{255}}{15}\tan\left(\frac{\pi}{4} - \frac{x}{2}\right)\right] + C$

Provide an appropriate response.

445) A student knows that $\int_a^{+\infty} f(x)\, dx$ converges. Does $\int_{-\infty}^a f(x)\, dx$ also necessarily converge? 445) ______

A) No B) Yes

Solve the problem.

446) The following table shows the rate of water flow (in gal/min) from a stream into a pond during a 30-minute period after a thunderstorm. Use the Trapezoidal Rule to estimate the total amount of water flowing into the pond during this period. 446) ______

Time (min)	Rate (gal/min)
0	250
5	300
10	350
15	300
20	270
25	250
30	200

A) 9600 gallons B) 8475 gallons C) 8483.3 gallons D) 7716.7 gallons

Evaluate the integral.

447) $\int \frac{dx}{5 + 13 \sin 2x}$ 447) ______

A) $-\frac{1}{12}\ln\left|\frac{5 + 13 \sin 2x + 12 \cos 2x}{5 + 13 \sin 2x}\right| + C$ B) $\frac{1}{24}\ln\left|\frac{5 + 13 \sin x + 12 \cos x}{5 + 13 \sin 2x}\right| + C$

C) $-\frac{1}{24}\ln\left|\frac{13 + 5 \sin 2x + 12 \cos 2x}{5 + 13 \sin 2x}\right| + C$ D) $-\frac{1}{24}\ln\left|\frac{13 + 5 \cos 2x + 12 \sin 2x}{5 + 13 \sin 2x}\right| + C$

Solve the problem.

448) Find an upper bound for the error in estimating $\int_0^{\pi} 5x \sin x \, dx$ using the Trapezoidal Rule with n = 6 steps. Give your answer as a decimal rounded to four decimal places. 448) ______

A) 0.3690 B) 1.8452 C) 1.0766 D) 1.1274

Evaluate the integral.

449) $\int 2 \sin 7x \sin 4x \, dx$ 449) ______

A) $2(\sin 3x - \sin 11x) + C$ B) $2\left(\frac{\sin 3x}{6} + \frac{\sin 11x}{22}\right) + C$

C) $2\left(\frac{\sin 3x}{6} - \frac{\sin 11x}{22}\right) + C$ D) $2\left(\frac{\cos 3x}{6} - \frac{\cos 11x}{22}\right) + C$

Solve the initial value problem for y as a function of x.

450) $x\frac{dy}{dx} = \sqrt{x^2 - 9}$, $x \ge 3$, $y(3) = 0$ 450) ______

A) $y = \frac{\sqrt{x^2 - 9}}{3 \sec^{-1}(x/3)}$ B) $y = 3 \ln \frac{x}{3}$

C) $y = \frac{\sqrt{x^2 - 9}}{3} - x + 3$ D) $y = 3\left[\frac{\sqrt{x^2 - 9}}{3} - \sec^{-1}\left(\frac{x}{3}\right)\right]$

Integrate the function.

451) $\int \frac{dx}{(x^2 - 9)^{3/2}}$, $x > 3$ 451) ______

A) $\frac{\sqrt{x^2 - 9}}{x} + C$ B) $-\frac{x}{\sqrt{x^2 - 9}} + C$ C) $\frac{9x}{\sqrt{x^2 - 9}} + C$ D) $-\frac{x}{9\sqrt{x^2 - 9}} + C$

Evaluate the integral.

452) $\int \frac{e^x \, dx}{\sqrt{1 - e^{2x}}}$ 452) ______

A) $-2\sqrt{1 - e^{2x}} + C$ B) $\sin^{-1}(e^x) + C$

C) $e^x \sin^{-1}(e^x) + C$ D) $\sec^{-1}(e^x) + C$

Solve the problem by integration.

453) The current i (in A) as a function of the time t (in s) in a certain electric circuit is given by $i = \frac{6t + 2}{3t^2 + 2t + 1}$. Find the total charge that passes a given point in the circuit during the first two seconds. 453) ______

A) 2.833 C B) 2.773 C C) 8.500 C D) 0.944 C

Evaluate the integral.

454) $\int \frac{dx}{x(1 + 36 \ln^2 x)}$ 454) ______

A) $\frac{1}{6x}\tan^{-1}(6 \ln x) + C$ B) $\frac{1}{6}\tan^{-1}(36 \ln^2 x) + C$

C) $\frac{1}{72}\ln(1 + 36 \ln^2 x) + C$ D) $\frac{1}{6}\tan^{-1}(6 \ln x) + C$

455) $\int \cos 6x \cos 3x \, dx$ 455) ______

A) $\frac{1}{6}\sin 6x + \frac{1}{18}\sin 3x + C$ B) $\frac{1}{6}\sin 3x + \frac{1}{18}\sin 9x + C$

C) $\frac{1}{6}\cos 3x + \frac{1}{18}\cos 9x + C$ D) $\frac{1}{6}\sin 3x - \frac{1}{18}\sin 9x + C$

Evaluate the integral by making a substitution and then using a table of integrals.

456) $\int \frac{e^x}{e^{2x} - 4} dx$ 456) ______

A) $\frac{1}{4}\ln\left|\frac{2 - x}{x + 2}\right| + C$ B) $\frac{1}{4}\ln\left|\frac{2 - e^{2x}}{e^{2x} + 2}\right| + C$

C) $\frac{1}{4}\ln\left|\frac{2 - e^x}{e^x + 2}\right| + C$ D) $\frac{1}{4}\ln\left|\frac{e^x + 2}{e^x - 2}\right| + C$

Solve the initial value problem for x as a function of t.

457) $(t^2 + 2t)\frac{dx}{dt} = 2x + 12$, $x(1) = 1$ 457) ______

A) $x = \frac{20t}{t + 2} - 6$ B) $x = 21 \ln\left|\frac{t}{t + 2}\right| - 6$

C) $x = 21t + \ln|t + 2| - 6$ D) $x = \frac{21t}{t + 2} - 6$

Solve the problem by integration.

458) Find the area bounded by $y = \frac{x - 14}{x^2 - 5x - 36}$, y = 0, x = 3, and x = 5. Round to the nearest hundredth. 458) ______

A) 6.55 B) 0.19 C) 2.5 D) 0.5

Evaluate the integral.

459) $\int \sin t \sec(\cos t) \, dt$ 459) ______

A) $\ln|\csc(\cos t) + \cot(\cos t)| + C$ B) $-\ln|\sec(\sin t) + \tan(\sin t)| + C$

C) $\ln|\sec(\cos t) + \tan(\cos t)| + C$ D) $-\ln|\sec(\cos t) + \tan(\cos t)| + C$

Solve the problem.

460) Find an upper bound for the error in estimating $\int_1^4 (4x^4 - 4x)dx$ using Simpson's Rule with n = 6 steps. 460) ______

A) $\frac{1}{10}$ B) $\frac{1}{20}$ C) 1 D) $\frac{243}{256}$

Use Simpson's Rule with n = 4 steps to estimate the integral.

461) $\int_1^3 \frac{7}{x^2} dx$ 461) ______

A) $\frac{12691}{5400}$ B) $\frac{581}{150}$ C) $\frac{987}{200}$ D) $\frac{12691}{2700}$

Evaluate the integral by making a substitution and then using a table of integrals.

462) $\int \frac{\cos \theta}{\sin \theta \sqrt{9 + \sin^2 \theta}} d\theta$ 462) ______

A) $-\frac{1}{3}\ln\left|\frac{3 + \sqrt{9 + \sin^2 \theta}}{\sin \theta}\right| + C$ B) $-\frac{1}{3}\ln\left|\frac{3 \cos \theta + \sqrt{9 + \sin^2 \theta}}{\sin \theta}\right| + C$

C) $-\frac{1}{3}\ln\left|\frac{3 - \sqrt{9 + \sin^2 \theta}}{\sin \theta}\right| + C$ D) $-\frac{1}{3}\ln\left|\frac{3 + \sqrt{9 + \sin^2 \theta}}{\sin \theta \cos \theta}\right| + C$

Expand the quotient by partial fractions.

463) $\frac{5x + 43}{x^2 + 10x + 21}$ 463) ______

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

Solve the problem.

464) Find the length of the curve $y = \ln(\sin x)$, $\frac{\pi}{6} \le x \le \frac{\pi}{3}$. 464) ______

A) 1.8663 B) 0.1134 C) 0.7677 D) 0.9163

Evaluate the integral.

465) $\int \frac{1}{x\sqrt{49 + x^2}} dx$ 465) ______

A) $-\frac{1}{7}\ln\left|\frac{7 + \sqrt{49 + x^2}}{x^2}\right| + C$ B) $-\frac{1}{7}\ln\left|\frac{7 + \sqrt{49 + x^2}}{x}\right| + C$

C) $-\frac{1}{7}\ln\left|\frac{7 - \sqrt{49 + x^2}}{x}\right| + C$ D) $\frac{1}{7}\ln\left|\frac{7 + \sqrt{49 + x^2}}{x}\right| + C$

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

466) $\int_0^1 x(1 + x^2)^2 \, dx$ 466) ______

x	$x(1 + x^2)^2$
0	0
0.125	0.12894
0.25	0.28223
0.375	0.48788
0.5	0.78125
0.625	1.20865
0.75	1.83105
0.875	2.72775
1	4

A) S = 1.02852; E_S = 0.13814 B) S = 1.79279; E_S = −0.01261

C) S = 1.16675; E_S = −0.00008 D) S = 1.18097; E_S = −0.01430

Express the integrand as a sum of partial fractions and evaluate the integral.

467) $\int_4^6 \frac{3x^3 - 4x}{x^4 - 16} dx$ 467) ______

A) 1.327 B) −1.184 C) 2.367 D) 1.184

Solve the problem.

468) Suppose that the accompanying table shows the velocity of a car every second for 8 seconds. Use the Trapezoidal Rule to approximate the distance traveled by the car in the 8 seconds.

Time (sec)	Velocity (ft/sec)
0	17
1	18
2	19
3	21
4	20
5	22
6	19
7	17
8	18

A) 171 feet B) 153.5 feet C) 233.5 feet D) 307 feet

469) Evaluate $\int \cos^7 x\,dx$

A) $\frac{1}{7}\cos^5 x \sin x + \frac{1}{5}\cos^3 x \sin x + \frac{1}{3}\cos x \sin x + C$

B) $\frac{1}{7}\cos^6 x + \frac{6}{35}\cos^4 x + \frac{8}{35}\cos^2 x + \frac{16}{35}\sin x + C$

C) $\frac{1}{7}\cos^6 x \sin x + \frac{6}{35}\cos^4 x \sin x + \frac{8}{35}\cos^2 x \sin x + \frac{16}{35}\sin x + C$

D) $\frac{1}{7}\cos^6 x \sin x + \frac{1}{5}\cos^4 x \sin x + \frac{1}{3}\cos^2 x \sin x + \sin x + C$

Use the substitution z = tan (x/2) to evaluate the integral.

470) $\int_0^{\pi/3} \frac{dx}{1 - \sin x}$

A) $\frac{1 + \sqrt{3}}{2}$ B) $1 + \sqrt{3}$ C) $1 - \sqrt{3}$ D) $-3 - \sqrt{3}$

Solve the problem.

471) The following table shows the rate of water flow (in gal/min) from a stream into a pond during a 30-minute period after a thunderstorm. Use the Simpson's Rule to estimate the total amount of water flowing into the pond during this period.

Time (min)	Rate (gal/min)
0	225
5	275
10	325
15	275
20	245
25	225
30	175

A) 8850 gallons B) 7733.3 gallons C) 7050.0 gallons D) 7725 gallons

Evaluate the integral by using trigonometric identities and substitutions to reduce it to standard form.

472) $\int \frac{\cot x}{\csc^3 x}\,dx$

A) $-\frac{1}{3}\sin^3 x + C$ B) $\frac{1}{3}\sin^3 x + C$ C) $\frac{1}{3}\cos^3 x + C$ D) $-\csc x + C$

Solve the problem by integration.

473) Find the volume generated by revolving the first-quadrant area bounded by $y = \frac{x}{(x + 8)^2}$ and x = 8 about the x-axis.

A) $\frac{1}{3}\pi$ B) $\frac{1}{192}\pi$ C) $\frac{1}{384}\pi$ D) $\frac{1}{96}\pi$

Determine whether the improper integral converges or diverges.

474) $\int_0^3 \frac{x^2\,dx}{\sqrt{9 - x^2}}$

A) Diverges B) Converges

Evaluate the integral by reducing the improper fraction and using a substitution if necessary.

475) $\int \frac{20x^2 + 28x}{10x - 1}\,dx$

A) $x^2 - 3x + \ln|10x - 1| + C$ B) $x^2 + 3x + \frac{3}{10}\ln|10x - 1| + C$

C) $2x + 3 - \ln|10x - 1| + C$ D) $x^2 - 3x - \frac{3}{10}\ln|10x - 1| + C$

Determine whether the improper integral converges or diverges.

476) $\int_1^{\infty} \frac{|\sin x|}{x^2}\,dx$

A) Converges B) Diverges

Find the surface area or volume.

477) The region between the curve $y = \frac{1}{\sqrt{1 + \cos x}}$, $0.1 \le x \le 0.8$, and the x-axis is revolved about the x-axis to generate a solid. Use a table of integrals to find the volume of the solid generated to two decimal places.

A) 1.17 B) 1.38 C) 1.23 D) 1.49

Evaluate the integral.

478) $\int_{-\pi/12}^{\pi/12} \tan^4 3t\,dt$

A) $-\frac{4}{9}$ B) $\frac{\pi}{9} - \frac{2}{9}$ C) $\frac{\pi}{6} - \frac{4}{9}$ D) $\frac{\pi}{6}$

479) $\int \text{csch}^3 10x \coth 10x\,dx$

A) $\frac{\text{csch}^3 10x}{30} + C$ B) $-\frac{\text{csch}^3 10x \coth 10x}{30} + C$

C) $-\frac{\text{csch}^3 10x}{3} + C$ D) $-\frac{\text{csch}^3 10x}{30} + C$

480) $\int \frac{\sqrt{16 + 2x}}{x}\,dx$

A) $2\sqrt{16 + 2x} - 4\ln\left(\frac{\sqrt{16 + 2x} - 4}{\sqrt{16 + 2x} + 4}\right) + C$ B) $2\sqrt{16 + 2x} + C$

C) $2\sqrt{16 + 2x} + 4\tan^{-1}\left(\frac{\sqrt{16 + 2x}}{4}\right) + C$ D) $2\sqrt{16 + 2x} + 4\ln\left(\frac{\sqrt{16 + 2x} - 4}{\sqrt{16 + 2x} + 4}\right) + C$

481) $\int e^{5x} \cos 4x\,dx$

A) $\frac{e^{5x}}{41}[4 \sin 4x + 5 \cos 4x] + C$ B) $\frac{e^{5x}}{41}[4 \sin 4x - 5 \cos 4x] + C$

C) $\frac{1}{41}[4e^{5x} \sin 4x + 5 \cos 4x] + C$ D) $\frac{e^{5x}}{2}[\sin 4x + \cos 4x] + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

482) $\int \frac{x + 9}{x^2 + 7x}\,dx$

A) $\frac{1}{7}\ln\left|\frac{x^9}{(x + 7)^2}\right| + C$ B) $\ln\left|\frac{x^9}{(x + 7)^2}\right| + C$

C) $\frac{9}{7}\ln|x^9(x + 7)^2| + C$ D) $\frac{1}{7}\ln|x^9(x + 7)^2| + C$

Solve the problem by integration.

483) Find the volume generated by rotating the area bounded by $y = \frac{1}{x^3 + 9x^2 + 8x}$, x = 2, x = 7, and y = 0 about the y-axis.

A) $\frac{2}{7}\pi \ln \frac{16}{9}$ B) $\frac{2}{7}\pi \ln \frac{8}{15}$ C) $\frac{7}{2}\pi \ln \frac{9}{16}$ D) $\frac{1}{7}\pi \ln \frac{16}{9}$

Evaluate the integral by first performing long division on the integrand and then writing the proper fraction as a sum of partial fractions.

484) $\int \frac{9x^3 + 18x^2 + 12x + 5}{9x^2 + 18x + 9}\,dx$

A) $\frac{1}{2}x^2 + \ln|3x + 3| - \frac{2}{3}\frac{1}{3x + 3} + C$ B) $\frac{1}{2}x^2 - \frac{3x + 5}{3x + 3} + C$

C) $\frac{1}{2}x^2 + \ln|3x + 3| - \frac{2}{3x + 3} + C$ D) $\frac{1}{2}x^2 + \frac{1}{3}\ln|3x + 3| - \frac{2}{3}\frac{1}{3x + 3} + C$

Determine whether the improper integral converges or diverges.

485) $\int_{-1}^{1} \frac{1}{x \ln|x|}\,dx$

A) Converges B) Diverges

Integrate the function.

486) $\int \frac{\sqrt{x^2 + 64}}{7x^2}\,dx$

A) $\ln\left|\sqrt{x^2 + 64} + x\right| + \frac{\sqrt{x^2 + 64}}{7x} + C$ B) $\frac{1}{7}\ln\left|\sqrt{x^2 + 64} + x\right| - \frac{\sqrt{x^2 + 64}}{7x} + C$

C) $\frac{1}{7}\ln\left|\sqrt{x^2 + 64} + x\right| - \sin^{-1}\frac{x}{8} + C$ D) $x + \ln\left|\sqrt{x^2 + 64}\right| + \frac{\sqrt{x^2 + 64}}{7x} + C$

Use integration by parts to establish a reduction formula for the integral.

487) $\int \cos^n x\,dx$

A) $\int \cos^n x\,dx = \cos^{n-1} x \sin x - (n - 1)\int \sin x \cos^{n-2} x\,dx$

B) $\int \cos^n x\,dx = \frac{1}{n}\cos^{n-1} x \sin x + \frac{n - 1}{n}\int \cos^{n-2} x\,dx$

C) $\int \cos^n x\,dx = -\cos^{n-1} x \sin x + (n - 1)\int \cos^{n-2} x\,dx$

D) $\int \cos^n x\,dx = \frac{1}{n}\cos^{n-1} x \sin x - \frac{n - 1}{n}\int \cos^{n-1} x\,dx$

Evaluate the integral by making a substitution and then using a table of integrals.

488) $\int \tan t \cdot \sqrt{1 - \cos^2 t}\,dt$

A) $\ln|\sec t + \tan t| - \sin t + C$ B) $\ln|\csc t - \cot t| - \sin t + C$

C) $\ln|\sec t + \tan t| + \sin t + C$ D) $\ln|\sec t| + \cos t + C$

Evaluate the integral by eliminating the square root.

489) $\int_{\pi/3}^{\pi} \sqrt{\frac{1 - \cos 2x}{2}}\,dx$

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

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

490) $\int_{-1}^{1} (x^2 + 5)\,dx$

A) $\frac{55}{8}$ B) $\frac{32}{3}$ C) $\frac{43}{4}$ D) $\frac{43}{2}$

Evaluate the integral.

491) $\int 9 \cot^3 x \sin^2 x \, dx$

A) $9 \ln|\sin x| - \frac{9}{2} \sin x + C$　B) $9 \ln|\sin x| + \frac{9}{2} \cos^2 x + C$

C) $9(\ln|\sin x| + \sin x) + C$　D) $9 \ln|\sin x| - \frac{9}{2} \cos^2 x + C$

Find the integral.

492) $\int_0^1 \frac{4x \, dx}{\sqrt{4 + 2x^2}}$

A) $\frac{\sqrt{6}}{2} - 1$　B) $2\sqrt{6} - 4$　C) $\sqrt{6} - 2$　D) $-2\sqrt{6} + 4$

Evaluate the integral.

493) $\int_0^{1/2} 7 \sin^4 2\pi x \, dx$

A) $\frac{21}{8} - \frac{7}{8\pi}$　B) $\frac{21}{8}$　C) $\frac{21}{16} - \frac{7}{\pi}$　D) $\frac{21}{16}$

Solve the problem.

494) A rectangular swimming pool is being constructed, 18 feet long and 100 feet wide. The depth of the pool is measured at 3-foot intervals across the width of the pool. Estimate the volume of water in the pool using the Trapezoidal Rule.

Width (ft)	Depth (ft)
0	3
3	3.5
6	4
9	5
12	5.5
15	6
18	7

A) 8700 ft^3　B) 7700 ft^3　C) 5800 ft^3　D) 10,200 ft^3

Use the substitution z = tan (x/2) to evaluate the integral.

495) $\int \sec x \, dx$

A) $\ln\left|\frac{2 + \tan(x/2)}{2 - \tan(x/2)}\right| + C$　B) $\ln\left|\frac{1+x}{1-x}\right| + C$

C) $\ln\left|\frac{2+x}{2-x}\right| + C$　D) $\ln\left|\frac{1 + \tan(x/2)}{1 - \tan(x/2)}\right| + C$

Solve the problem.

496) A data-recording thermometer recorded the soil temperature in a field every 2 hours from noon to midnight, as shown in the following table. Use the Trapezoidal Rule to estimate the average temperature for the 12-hour period.

Time	Temp (°F)
Noon	67
2	68
4	70
6	70
8	69
10	69
Midnight	68

A) 82.70°F　B) 68.92°F　C) 80.17°F　D) 68.94°F

497) Find an upper bound for the error in estimating $\int_2^3 (4x^5 - 2x)dx$ using Simpson's Rule with n = 8 steps.

A) $\frac{1}{512}$　B) $\frac{1}{256}$　C) $\frac{81}{512}$　D) $\frac{1}{1536}$

Solve the problem by integration.

498) Under certain conditions, the velocity v (in m/s) of an object moving along a straight line as a function of the time t (in s) is given by $v = \frac{2t^2 + 18t + 20}{(3t+1)(t+3)^2}$. Find the distance traveled by the object during the first 3.00 s.

A) 0.944 m　B) 1.202 m　C) 4.939 m　D) 1.868 m

Evaluate the integral.

499) $\int \frac{dx}{x^2\sqrt{4x - 7}}$

A) $\frac{\sqrt{4x-7}}{7x} + \frac{4}{7\sqrt{7}} \ln\left|\frac{\sqrt{4x-7} - \sqrt{7}}{\sqrt{4x-7} + \sqrt{7}}\right| + C$　B) $-\frac{\sqrt{4x-7}}{7x} - \frac{4}{7\sqrt{7}} \tan^{-1}\sqrt{\frac{4x-7}{7}} + C$

C) $\frac{\sqrt{4x-7}}{7x} + \frac{4}{7\sqrt{7}} \tan^{-1}\sqrt{\frac{4x-7}{7}} + C$　D) $\frac{\sqrt{4x-7}}{7} - \frac{4}{7\sqrt{7}} \tan^{-1}\sqrt{\frac{4x-7}{7x}} + C$

500) $\int \sec^3 2x \, dx$

A) $\frac{1}{4}\sec 2x \tan 2x + \frac{1}{4}\ln|\sec 2x + \tan 2x| + C$　B) $\frac{1}{4}\sec 2x \tan 2x + \frac{1}{4}\ln|\sec 2x + \cot 2x| + C$

C) $\frac{1}{4}\sec^2 2x \tan 2x + \frac{1}{4}\ln|\sec 2x + \tan 2x| + C$　D) $\frac{1}{4}\sec 2x \tan 2x - \frac{1}{2}\ln|\sec 2x + \tan 2x| + C$

Evaluate the improper integral or state that it is divergent.

501) $\int_0^{\infty} \frac{2dx}{16 + x^2}$

A) $\pi + 4$　B) $\frac{\pi}{16}$　C) $\frac{\pi}{4}$　D) 0

Determine whether the improper integral converges or diverges.

502) $\int_1^{\infty} \frac{\sqrt{x}}{\sqrt{x^4 + 6}} dx$

A) Converges　B) Diverges

Use the Trapezoidal Rule with n = 4 steps to estimate the integral.

503) $\int_0^1 \frac{8}{1+x} dx$

A) $\frac{1171}{105}$　B) $\frac{743}{105}$　C) $\frac{1171}{210}$　D) $\frac{1747}{630}$

Evaluate the integral.

504) $\int \frac{dy}{2\sqrt{y}\,(81 + y)}$

A) $\frac{1}{9} \tan \frac{\sqrt{y}}{9} + C$　B) $\frac{1}{9} \tan^{-1} \frac{y}{9} + C$

C) $\frac{1}{9} \tan^{-1} \frac{\sqrt{y}}{9} + C$　D) $\frac{1}{2} \tan^{-1} \frac{\sqrt{y}}{9} + C$

Find the integral.

505) $\int \frac{6x^5 dx}{(8 + x^6)^6}$

A) $-\frac{1}{7(8 + x^6)^7} + C$　B) $-\frac{6x^5}{(8 + x^6)^5} + C$

C) $-\frac{1}{5(8 + x^6)^5} + C$　D) $\frac{1}{7}(8 + x^6)^7 + C$

Solve the initial value problem for x as a function of t.

506) $(2t^3 - 2t^2 + t - 1)\frac{dx}{dt} = 3, \; x(2) = 0$

A) $x = \ln|t - 1| - \frac{1}{2}\ln\left|t^2 + \frac{1}{2}\right| + \frac{1}{2}\ln 4.5$

B) $x = \ln|t - 1| - \tan^{-1}\sqrt{2}\,t - \ln\left|t^2 + \frac{1}{2}\right| + \tan^{-1} 2\sqrt{2} + \ln 4.5$

C) $x = \ln|t - 1| - \sqrt{2}\tan^{-1}\sqrt{2}\,t + \sqrt{2}\tan^{-1} 2\sqrt{2}$

D) $x = \ln|t - 1| - \sqrt{2}\tan^{-1}\sqrt{2}\,t - \frac{1}{2}\ln\left|t^2 + \frac{1}{2}\right| + \sqrt{2}\tan^{-1} 2\sqrt{2} + \frac{1}{2}\ln 4.5$

Solve the problem.

507) Estimate the minimum number of subintervals needed to approximate the integral

$$\int_3^4 (2x^3 + 3x)dx$$

with an error of magnitude less than 10^{-4} using the Trapezoidal Rule.

A) 174　B) 100　C) 101　D) 200

Evaluate the integral.

508) $\int \frac{dw}{w \sin(\ln w)}$

A) $-\ln|\csc w + \cot w| \cdot \ln w + C$　B) $-\ln|\csc(\ln w) + \cot(\ln w)| + C$

C) $-\ln|\csc w + \cot w| + C$　D) $\ln|\sec(\ln w) + \tan(\ln w)| + C$

509) $\int e^t \cot(e^t - 5)dt$

A) $e^t \ln|\sin(t - 5)| + C$　B) $\ln|\sin(e^t - 5)| + C$

C) $\ln|\cos(e^t - 5)| + C$　D) $\ln|\sin(t - 5)| + C$

Evaluate the improper integral or state that it is divergent.

510) $\int_8^{\infty} \frac{dx}{(x - 7)(x - 6)}$

A) ln 2　B) ln 7　C) $-\frac{1}{7}\ln 2$　D) $\frac{1}{2}\ln 8$

Solve the problem.

511) The base of a solid is the region between the curve $y = \sin\frac{x}{2}$ and the interval $[0, 2\pi]$ on the x-axis. The cross sections perpendicular to the x-axis are semicircles with bases running from the x-axis to the curve. Find the volume of the solid. Round your answer to three decimal places.

A) 1.234　B) 1.5708　C) 2.3562　D) 6.2832

Use integration by parts to establish a reduction formula for the integral.

512) $\int (\ln ax)^n dx$

A) $\int (\ln ax)^n dx = \frac{x(\ln ax)^n}{n} - \frac{n}{a}\int (\ln ax)^{n-2} dx$

B) $\int (\ln ax)^n dx = x(\ln ax)^n - n\int (\ln ax)^{n-1} dx$

C) $\int (\ln ax)^n dx = ax(\ln ax)^n - an\int (\ln ax)^{n-1} dx$

D) $\int (\ln ax)^n dx = \frac{x(\ln ax)^n}{n} + \frac{n}{a}\int (\ln ax)^{n-1} dx$

Evaluate the integral.

513) $\int \left(5 + \frac{3}{x}\right) \cot(5x + 3 \ln x)\, dx$ 513) ______

A) $3 \ln x \cdot \ln|\sin(5x + 3 \ln x)| + C$
B) $\ln|\sin(5 + 3x)| + C$
C) $\ln|\cos(5x + 3 \ln x)| + C$
D) $\ln|\sin(5x + 3 \ln x)| + C$

514) $\int 7x^2 e^{2x}\, dx$ 514) ______

A) $\frac{7}{2}e^{2x}(2x^2 - 2x + 1) + C$
B) $\frac{7}{4}e^{2x}(2x^2 - 2x + 1) + C$
C) $7e^{2x}(2x^2 - 2x + 1) + C$
D) $\frac{7}{4}e^{2x}(x^2 - x + 1) + C$

Solve the problem.

515) Find the volume of the solid generated by revolving the region bounded by the curve $y = 3\cos x$ and the x-axis, $\frac{\pi}{2} \le x \le \frac{3\pi}{2}$, about the x-axis. 515) ______

A) 9π
B) $9\pi^2$
C) $\frac{9}{2}\pi^3$
D) $\frac{9}{2}\pi^2$

Evaluate the integral.

516) $\int \frac{3x\, dx}{x^2(1 + 3x^2)}$ 516) ______

A) $\ln\left|\frac{1 + 3x^2}{x^2}\right| + C$
B) $-\frac{3}{4} \ln\left|\frac{1 + 3x^2}{x^2}\right| + C$
C) $-\frac{3}{2} \ln\left|\frac{1 + 3x^2}{x^2}\right| + C$
D) $\frac{3}{2} \ln\left|\frac{1 + 3x^2}{x^2}\right| + C$

Find the surface area or volume.

517) Use substitution and a table of integrals to find, to two decimal places, the area of the surface generated by revolving the curve $y = e^x$, $0 \le x \le 2$, about the x-axis. 517) ______

A) 229.74
B) 189.29
C) 174.35
D) 212.40

Find the area or volume.

518) Find the volume of the solid generated by revolving the region in the first quadrant under the curve $y = \frac{6}{x^2}$, bounded on the left by $x = 1$, about the x-axis. 518) ______

A) 2π
B) 3π
C) 6π
D) $\frac{6}{5}\pi$

Solve the problem.

519) Find the area bounded by $y = \frac{3}{\sqrt{36 - 9x^2}}$, $x = 0$, $y = 0$, and $x = 3$. 519) ______

A) $\frac{1}{6} \tan^{-1}\left(\frac{3}{2}\right)$
B) $\sin^{-1}\left(\frac{3}{2}\right)$
C) $\frac{1}{2} \tan^{-1}\left(\frac{1}{2}\right)$
D) $\frac{1}{6} \sin^{-1}\left(\frac{3}{2}\right)$

Evaluate the integral.

520) $\int \frac{e^{1/t^6}}{t^7}\, dt$ 520) ______

A) $-\frac{e^{1/t^6}}{6t^6} + C$
B) $-e^{1/t^6} + C$
C) $\frac{e^{-1/t^6}}{6} + C$
D) $-\frac{e^{1/t^6}}{6} + C$

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

521) $\int_0^{\pi/2} \sin^3 x \cos x\, dx$ 521) ______

x	$\sin^3 x \cos x$
0	0
0.19635	0.00728
0.39270	0.05178
0.58905	0.14258
0.78540	0.25
0.98175	0.31936
1.17810	0.30178
1.37445	0.18406
1.57080	0

A) $S = 0.25003$; $E_S = -0.00003$
B) $S = 0.25141$; $E_S = -0.00141$
C) $S = 0.24678$; $E_S = 0.00322$
D) $S = 0.24353$; $E_S = 0.00647$

Use integration by parts to establish a reduction formula for the integral.

522) $\int \sin^n x\, dx$ 522) ______

A) $\int \sin^n x\, dx = -\frac{1}{n}\sin^{n-1} x \cos x + \frac{n-1}{n}\int \sin^{n-2} x\, dx$
B) $\int \sin^n x\, dx = \sin^{n-1} x \cos x - (n-1)\int \cos x \sin^{n-2} x\, dx$
C) $\int \sin^n x\, dx = -\frac{1}{n}\sin^{n-1} x \cos x - \frac{n-1}{n}\int \sin^{n-1} x\, dx$
D) $\int \sin^n x\, dx = \sin^{n-1} x \cos x + (n-1)\int \sin^{n-2} x\, dx$

Find the centroid.

523) Find the centroid of the region bounded by the graphs of $y = x$ and $y = x^2 - 6x$ 523) ______

A) $(X, Y) = \left(\frac{7}{2}, -\frac{6}{5}\right)$
B) $(X, Y) = \left(3, -\frac{7}{5}\right)$
C) $(X, Y) = \left(\frac{7}{2}, -\frac{7}{5}\right)$
D) $(X, Y) = \left(3, -\frac{6}{5}\right)$

Evaluate the integral.

524) $\int_0^{\infty} e^{-x} \cos 5x\, dx$ 524) ______

A) $\frac{5}{26}$
B) 1
C) Diverges
D) $\frac{1}{26}$

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

525) $\int_1^4 \frac{\sqrt{x} - 1}{\sqrt{x}}\, dx$ 525) ______

x	$(\sqrt{x} - 1)/\sqrt{x}$
1	0
1.375	0.14720
1.75	0.24407
2.125	0.31401
2.5	0.36754
2.875	0.41023
3.25	0.44530
3.625	0.47477
4	0.5

A) $T = 1.08867$; $E_T = -0.08867$
B) $T = 1.98984$; $E_T = 0.01016$
C) $T = 0.99492$; $E_T = 0.00508$
D) $T = 0.99983$; $E_T = 0.00017$

Evaluate the integral.

526) $\int x^3 \ln 8x\, dx$ 526) ______

A) $\frac{1}{4}x^4 \ln 8x - \frac{1}{16}x^4 + C$
B) $\ln 8x - \frac{1}{4}x^4 + C$
C) $\frac{1}{4}x^4 \ln 8x + \frac{1}{16}x^4 + C$
D) $\frac{1}{4}x^4 \ln 8x - \frac{1}{20}x^5 + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

527) $\int \frac{-2x^2 + 8x + 8}{(x^2 + 4)(x - 2)^3}\, dx$ 527) ______

A) $\frac{1}{2}\tan^{-1}\frac{x}{2} - \frac{1}{(x-2)^2} + \frac{1}{(x-2)^3} + C$
B) $\frac{1}{2}\tan^{-1}\frac{x}{2} + \ln|x - 2| - \frac{1}{(x-2)^2} + C$
C) $\frac{1}{2}\tan^{-1}\frac{x}{2} + \frac{1}{x-2} - \frac{1}{(x-2)^2} + C$
D) $\tan^{-1}\frac{x}{2} - \frac{2}{x-2} - \frac{1}{(x-2)^2} + C$

Solve the problem by integration.

528) Find the x-coordinate of the centroid of the first-quadrant area bounded by $y = \frac{7}{x^3 + x}$, $x = 2$, and $x = 5$. 528) ______

A) 1.448
B) −0.727
C) 2.895
D) −0.364

Evaluate the integral.

529) $\int_0^{\pi} \sin 3t \cos 2t\, dt$ 529) ______

A) $\frac{1}{5}$
B) $\frac{7}{5}$
C) $\frac{6}{5}$
D) $\frac{3}{5}$

Solve the problem.

530) Find the length of the curve $y = \sqrt{16 - x^2}$ between $x = 0$ and $x = 2$. 530) ______

A) $\frac{2}{3}\pi$
B) $\frac{4}{3}\pi$
C) π
D) $\frac{1}{6}\pi$

531) Find the area of the region enclosed by the curve $y = x \cos x$ and the x-axis for $\frac{5}{2}\pi \le x \le \frac{7}{2}\pi$. 531) ______

A) -7π
B) -6π
C) 7π
D) 6π

Expand the quotient by partial fractions.

532) $\frac{x + 6}{x^2 + 8x + 16}$ 532) ______

A) $\frac{1}{x + 4} - \frac{2}{(x + 4)^2}$
B) $\frac{1}{x + 4} + \frac{3}{x + 6}$
C) $\frac{2}{x + 4} + \frac{1}{(x + 4)^2}$
D) $\frac{1}{x + 4} + \frac{2}{(x + 4)^2}$

Evaluate the improper integral.

533) $\int_{-27}^{8} \frac{dx}{x^{2/3}}$ 533) ______

A) 0
B) −3
C) 5
D) 15

Evaluate the integral.

534) $\int_0^{1/8} y \tan^{-1} 8y\, dy$ (Give your answer in exact form.) 534) ______

A) $\frac{\pi}{4} - \frac{1}{2}$
B) $\frac{\pi}{512} - \frac{1}{128}$
C) $\frac{\pi}{256} - \frac{1}{128}$
D) $\frac{1}{256}$

Evaluate the integral by using a substitution prior to integration by parts.

535) $\int_0^1 \frac{x}{\sqrt{x + 1}}\, dx$ 535) ______

A) −1.33
B) −2.27
C) 0.39
D) −0.94

Evaluate the integral.

536) $\int_{-\pi/2}^{\pi/2} \cos^5 6x\, dx$ 536) ______

A) 0
B) $\frac{1}{3}$
C) $\frac{4}{45}$
D) $\frac{8}{45}$

Provide an appropriate response.

537) A student knows that $\int_a^{+\infty} dx = 98$. Can $\int_{-\infty}^{-1} f(x)\, dx$ be found, and if so, what is it? 537) ______

A) Yes, −98
B) No

Solve the initial value problem for y as a function of x.

538) $(x^2 + 81)\frac{dy}{dx} = 1,\ y(9) = 0$ 538) ______

A) $y = \frac{x}{9} - 1$
B) $y = \frac{1}{9}\tan^{-1}\frac{x}{9}$
C) $y = \frac{1}{9}\sin^{-1}\frac{x}{9} - \frac{\pi}{18}$
D) $y = \frac{1}{9}\tan^{-1}\frac{x}{9} - \frac{\pi}{36}$

Find the area or volume.

539) Find the area between the graph of $y = \frac{8}{(x-1)^2}$ and the x-axis, for $-\infty < x \le 0$. 539) ______

A) 8 B) 1 C) 4 D) 16

Solve the problem.

540) The length of one arch of the curve $y = 3 \sin 2x$ is given by 540) ______

$$L = \int_0^{\pi/2} \sqrt{1 + 36\cos^2 2x}\, dx$$

Estimate L by the Trapezoidal Rule with n = 6.

A) 6.1995 B) 5.8169 C) 6.4115 D) 6.0189

Evaluate the integral.

541) $\int e^{\cot v} \csc^2 v\, dv$ 541) ______

A) $-e^{\csc v} + C$
B) $-e^{\cot v} \csc v + C$
C) $e^{\cot v} + C$
D) $-e^{\cot v} + C$

542) $\int \sin^5 4x\, dx$ 542) ______

A) $-\frac{1}{5}\sin^4 4x \cos 4x - \frac{4}{15}\sin^2 4x \cos 4x - \frac{2}{3}\cos 4x + C$
B) $-\frac{1}{20}\cos^4 4x \sin 4x - \frac{2}{15}\cos^2 4x \sin 4x - \frac{1}{30}\cos 4x + C$
C) $-\frac{1}{20}\sin^4 4x \cos 4x - \frac{1}{15}\sin^2 4x \cos 4x - \frac{1}{6}\sin 8x + \frac{x}{2} + C$
D) $-\frac{1}{20}\sin^4 4x \cos 4x - \frac{1}{15}\sin^2 4x \cos 4x - \frac{2}{15}\cos 4x + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

543) $\int \frac{72}{t^3 + 2t^2 - 8t}\, dt$ 543) ______

A) $-\frac{9}{t} + 6\ln|t-2| + 3\ln|t+4| + C$
B) $-9\ln|t| + 6\ln|t^2 - 2| + C$
C) $-9\ln|t| + 6\ln|t-2| + 3\ln|t+4| + C$
D) $-3\ln|t| + 6\ln|t-2| - 3\ln|t+4| + C$

Evaluate the integral.

544) $\int y^2 \sin 8y\, dy$ 544) ______

A) $-\frac{1}{8}y^2 \sin 8y + \frac{1}{32}y\cos 8y + \frac{1}{256}\sin 8y + C$
B) $\frac{1}{8}y^2 \cos 8y - \frac{1}{32}y \sin 8y - \frac{1}{256}\cos 8y + C$
C) $-\frac{1}{8}y^2 \cos 8y + \frac{1}{32}y\sin 8y + \frac{1}{256}\cos 8y + C$
D) $-\frac{1}{8}y^2 \cos 8y + \frac{1}{4}y \sin 8y + \frac{1}{4}\cos 8y + C$

Express the integrand as a sum of partial fractions and evaluate the integral.

545) $\int_0^1 \frac{x^3}{x^2 + 12x + 36}\, dx$ 545) ______

A) $18\ln 7 - \frac{251}{14}$
B) $108\ln\left(\frac{7}{6}\right) - \frac{233}{14}$
C) $108\ln 7 - 18\ln 6 + \frac{233}{14}$
D) $144\ln\left(\frac{7}{6}\right) - \frac{125}{14}$

Evaluate the improper integral or state that it is divergent.

546) $\int_{-\infty}^{\infty} \frac{20x}{(x^2 - 1)^2}\, dx$ 546) ______

A) 20 B) 40 C) Divergent D) 0

Determine whether the improper integral converges or diverges.

547) $\int_1^{\infty} \frac{9x + 6}{2x^3 + 3x^2 + 1}$ 547) ______

A) Diverges B) Converges

Evaluate the integral.

548) $\int -9x \cos 5x\, dx$ 548) ______

A) $-\frac{9}{25}\cos 5x - \frac{9}{5}\sin 5x + C$
B) $-\frac{9}{5}\cos 5x - 9x \sin 5x + C$
C) $-\frac{9}{25}\cos 5x - \frac{9}{5}x \sin 5x + C$
D) $-\frac{9}{25}\cos 5x - \frac{9}{5}x \sin 9x + C$

Determine whether the improper integral converges or diverges.

549) $\int_1^{\infty} e^{-x} \sin x\, dx$ 549) ______

A) Diverges B) Converges

Use the substitution z = tan (x/2) to evaluate the integral.

550) $\int \frac{dx}{12 + \sin x}$ 550) ______

A) $-\frac{2\sqrt{143}}{143}\tan^{-1}\left[\frac{\sqrt{143}}{13}\tan\left(\frac{x}{2}\right)\right] + C$
B) $-\frac{1}{12}\tan\left(\frac{\pi}{4} - \frac{x}{2}\right) + C$
C) $\frac{2\sqrt{143}}{143}\tan^{-1}\left[\frac{1}{13}\tan\left(\frac{\pi}{4} - \frac{x}{2}\right)\right] + C$
D) $-\frac{2\sqrt{143}}{143}\tan^{-1}\left[\frac{\sqrt{143}}{13}\tan\left(\frac{\pi}{4} - \frac{x}{2}\right)\right] + C$

Evaluate the improper integral or state that it is divergent.

551) $\int_1^{\infty} \frac{dx}{x^{3.007}}$ 551) ______

A) $\frac{1}{3.007}$ B) Divergent C) $\frac{1}{2.007}$ D) $\frac{1}{4.007}$

Expand the quotient by partial fractions.

552) $\frac{5x + 7}{(x-5)(x-1)}$ 552) ______

A) $\frac{8}{x-5} - \frac{3}{x-1}$
B) $\frac{8}{x-5} - \frac{3}{(x-5)(x-1)}$
C) $\frac{8}{x-5} + \frac{3}{x-1}$
D) $\frac{32}{x-5} + \frac{12}{x-1}$

Find the integral.

553) $\int_0^1 \frac{4x^3}{(1+x^4)^3}\, dx$ 553) ______

A) $\frac{3}{4}$ B) $\frac{7}{16}$ C) $\frac{3}{8}$ D) $\frac{1}{2}$

Evaluate the integral.

554) $\int \frac{dx}{(16 - x^2)^2}$ 554) ______

A) $\frac{1}{32}\left(\frac{x}{16 - x^2} + \frac{1}{8}\ln\left|\frac{x+4}{x-4}\right|\right) + C$
B) $\frac{1}{32}\left(\frac{x}{16 - x^2} - \frac{1}{8}\ln\left|\frac{x+4}{x-4}\right|\right) + C$
C) $\frac{1}{8}\ln\left|\frac{x+4}{x-4}\right| + C$
D) $\frac{x}{32(16 - x^2)} + C$

Evaluate the integral by eliminating the square root.

555) $\int_{\pi/6}^{\pi/4} \sqrt{9 + 9\cot^2 x}\, dx$ 555) ______

Give your answer as a decimal rounded to four decimal places.

A) −1.3068 B) 3.9203 C) 1.3068 D) 0.4356

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

556) $\int_0^{\pi/2} \sin^3 x \cos x\, dx$ 556) ______

x	$\sin^3 x \cos x$
0	0
0.19635	0.00728
0.39270	0.05178
0.58905	0.14258
0.78540	0.25
0.98175	0.31936
1.17810	0.30178
1.37445	0.18406
1.57080	0

A) $T = 0.24353;\ E_T = 0.00647$
B) $T = 0.24678;\ E_T = 0.00322$
C) $T = 0.49356;\ E_T = 0.00644$
D) $T = 0.25003;\ E_T = -0.00003$

Find the area or volume.

557) Find the area under $y = \frac{7}{1 + x^2}$ in the first quadrant. 557) ______

A) $\frac{7}{4}\pi$ B) 14π C) $\frac{7}{2}\pi$ D) 7π

Evaluate the integral by multiplying by a form of 1 and using a substitution (if necessary) to reduce it to standard form.

558) $\int \frac{1}{1 - \sin x}\, dx$ 558) ______

A) $-\cot x - \csc x + C$
B) $\cot x + \csc x + C$
C) $\tan x - \sec x + C$
D) $\tan x + \sec x + C$

Use the tabulated values of the integrand to estimate the integral with the Trapezoidal Rule with n = 8 steps. Then find the approximation error E_T. Round your answers to five decimal places.

559) $\int_0^1 x \sin(x^2 + 2)\, dx$ 559) ______

x	$x \sin(x^2 + 2)$
0	0
0.125	0.11284
0.25	0.22038
0.375	0.31575
0.5	0.38904
0.625	0.42647
0.75	0.41045
0.875	0.32128
1	0.14112

A) $T = 0.56669;\ E_T = 0.00715$
B) $T = 0.28335;\ E_T = 0.00358$
C) $T = 0.28693;\ E_T = 0.00003$
D) $T = 0.29217;\ E_T = -0.00525$

Evaluate the integral.

560) $\int 9 \cosh^5 2x\, dx$ 560) ______

A) $\frac{9}{10}\cosh^4 2x \sinh 2x + \frac{6}{5}\cosh^2 2x + \frac{12}{5}\cosh 2x + C$

B) $\frac{9}{10}\cosh^4 2x \sinh 2x + \frac{6}{5}\cosh^2 2x \sinh 2x + \frac{12}{5}\sinh 2x + C$

C) $\frac{9}{10}\cosh^4 2x \sinh 2x + \frac{18}{5}\cosh^2 2x \sinh 2x + \frac{36}{5}\sinh 2x + C$

D) $\frac{9}{10}\cosh^4 2x \sinh 2x + \frac{6}{5}\cosh^3 2x \sinh 2x + \frac{12}{5}\cosh^2 2x \sinh 2x + C$

561) $\int \frac{dx}{(x-4)\sqrt{x^2 - 8x + 12}}$ 561) ______

A) $\sec^{-1}\left|\frac{x-4}{2}\right| + C$

B) $\frac{1}{2}\sec^{-1}\left|\frac{x-4}{2}\right| + C$

C) $\sin^{-1}\left(\frac{x-4}{2}\right) + C$

D) $\frac{1}{2}\sec^{-1}\left|\frac{x+4}{2}\right| + C$

Use the tabulated values of the integrand to estimate the integral with Simpson's Rule with n = 8 steps. Then find the approximation error E_S. Round your answers to five decimal places.

562) $\int_0^{\pi/4} \sec^2\theta \sqrt{\tan\theta}\, d\theta$ 562) ______

θ	$\sec^2\theta\sqrt{\tan\theta}$
0	0
0.09817	0.31688
0.19635	0.46364
0.29452	0.60145
0.39270	0.75402
0.49087	0.93998
0.58905	1.18237
0.68722	1.51606
0.78540	2.0

A) S = 0.60047; E_S = 0.06620

B) S = 0.66508; E_S = 0.00159

C) S = 0.66591; E_S = 0.00075

D) S = 0.66424; E_S = 0.00243

Evaluate the integral by making a substitution and then using a table of integrals.

563) $\int \frac{x\, dx}{9x^2 + 12x + 4}$ 563) ______

A) $\frac{1}{3}\ln(3x^2 + 2x)$

B) $\frac{x}{3} - \frac{2}{9}\ln(3x+2) + C$

C) $\frac{1}{4}\left[\ln(2x+3) + \frac{3}{2x+3}\right] + C$

D) $\frac{1}{9}\left[\ln(3x+2) + \frac{2}{3x+2}\right] + C$

Use the substitution z = tan (x/2) to evaluate the integral.

564) $\int_0^{\pi/3} \frac{dx}{1 + \cos x}$ 564) ______

A) $\frac{\sqrt{2}}{2}$

B) $\frac{\sqrt{3}}{3}$

C) $\sqrt{2}$

D) $\sqrt{3}$

1) u = ax + b
du = a dx
$x = \frac{u-b}{a}$

$\int x(ax+b)^n dx = \int \frac{u-b}{a} \cdot u^n \cdot \frac{1}{a} du$ $(n \neq -1, -2)$

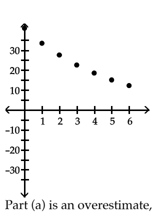
$= \frac{1}{a^2}\int u^{n+1} - b u^n du$

$= \frac{1}{a^2}\left[\frac{u^{n+2}}{n+2} - b \cdot \frac{u^{n+1}}{n+1}\right] + C$

$= \frac{u^{n+1}}{a^2}\left[\frac{u}{n+2} - \frac{b}{n+1}\right] + C$

$= \frac{(ax+b)^{n+1}}{a^2}\left[\frac{ax+b}{n+2} - \frac{b}{n+1}\right] + C$

2) (a) 143.5 gal
(b) About 12.63 h
(c)



(d) Part (a) is an overestimate, because the function r is concave up. Part (b) is an underestimate, because the overestimated result in part (a) means that there is more water remaining in the tank after 6 hours than was estimated.

3) (a) 1
(b) $\frac{\pi}{3}$
(c) $2\pi\int_1^\infty \frac{1}{x^5}\sqrt{x^6+4}\, dx$ converges by using the limit comparison test with the function $y = x^{-2}$.
(d) 7.61

4) $\int_0^\infty \frac{1}{\pi(1+x^2)} dx = \lim_{b\to\infty} \frac{1}{\pi}\int_0^b \frac{1}{1+x^2} dx = \lim_{b\to\infty}\frac{1}{\pi}\left[\tan^{-1}b - \tan^{-1}0\right] = \frac{1}{\pi}\cdot\frac{\pi}{2} = \frac{1}{2}$. Since f(x) is an even function, $\int_{-\infty}^0 \frac{1}{\pi(1+x^2)} dx = \frac{1}{2}$ and $\int_{-\infty}^\infty \frac{1}{\pi(1+x^2)} dx = \frac{1}{2} + \frac{1}{2} = 1$.

5) 0.74682 (Answers may vary slightly.)

6) (a) $\int_0^\infty \frac{1}{\sqrt{2\pi}} x e^{-x^2/2} dx = \lim_{b\to\infty}\int_0^b \frac{1}{\sqrt{2\pi}} x e^{-x^2/2} dx = \lim_{b\to\infty}\left[-\frac{1}{\sqrt{2\pi}} e^{-x^2/2}\right]_0^b = \frac{1}{\sqrt{2\pi}}$.

(b) Since $y = \frac{1}{\sqrt{2\pi}} x e^{-x^2/2}$ is an odd function, $\int_{-\infty}^0 \frac{1}{\sqrt{2\pi}} x e^{-x^2/2} dx = -\int_0^\infty \frac{1}{\sqrt{2\pi}} x e^{-x^2/2} dx = -\frac{1}{\sqrt{2\pi}}$. The mean of the distribution is equal to $\int_{-\infty}^\infty \frac{1}{\sqrt{2\pi}} x e^{-x^2/2} dx = \int_{-\infty}^0 \frac{1}{\sqrt{2\pi}} x e^{-x^2/2} dx + \int_0^\infty \frac{1}{\sqrt{2\pi}} x e^{-x^2/2} dx = \frac{1}{\sqrt{2\pi}} + -\frac{1}{\sqrt{2\pi}} = 0$.

7) 6.28319 (Answers may vary slightly.)

8) $|E_S| \le \frac{4}{9375}$

9) (a) Since $\int_{-\infty}^\infty \frac{1}{\sqrt{2\pi}} e^{-x^2/2} dx = 1$ and f(x) is an even function, $\int_0^\infty \frac{1}{\sqrt{2\pi}} e^{-x^2/2} dx = \frac{1}{2}$. Then $\int_0^\infty \frac{1}{\sqrt{2\pi}} x^2 e^{-x^2/2} dx = \lim_{b\to\infty}\int_0^b \frac{1}{\sqrt{2\pi}} x^2 e^{-x^2/2} dx = \lim_{b\to\infty}\frac{1}{\sqrt{2\pi}}\left[\left[-x e^{-x^2/2}\right]_0^b + \int_0^b e^{-x^2/2} dx\right] = \frac{1}{\sqrt{2\pi}}\int_0^\infty e^{-x^2/2} dx = \frac{1}{2}$.

(b) The variance of the distribution is equal to $\int_{-\infty}^\infty \frac{1}{\sqrt{2\pi}} x^2 e^{-x^2/2} dx = \int_{-\infty}^0 \frac{1}{\sqrt{2\pi}} x^2 e^{-x^2/2} dx + \int_0^\infty \frac{1}{\sqrt{2\pi}} x^2 e^{-x^2/2} dx = \frac{1}{2} + \frac{1}{2} = 1$.

10) u = ax + b
du = a dx
$x = \frac{u-b}{a}$

$\int x(ax+b)^{-1} dx = \int \frac{u-b}{a} \cdot u^{-1} \cdot \frac{1}{a} du$

$= \frac{1}{a^2}\int 1 - \frac{b}{u} du$

$= \frac{1}{a^2}\left[u - b\ln|u|\right] + k$

$= \frac{1}{a^2}\left[(ax+b) - b\ln|ax+b|\right] + k$

$= \frac{x}{a} + \frac{b}{a^2} - \frac{b}{a^2}\ln|ax+b| + k$

$= \frac{x}{a} - \frac{b}{a^2}\ln|ax+b| + \left(k + \frac{b}{a^2}\right)$

$= \frac{x}{a} - \frac{b}{a^2}\ln|ax+b| + C$

11) −0.39833 (Answers may vary slightly.)

12) $x = a \sin\theta$

$dx = a\cos\theta\, d\theta$

$\sqrt{a^2 - x^2} = \sqrt{a^2 - a^2\sin^2\theta} = \sqrt{a^2(1 - \sin^2\theta)} = \sqrt{a^2\cos^2\theta} = a\cos\theta$

$$\int \frac{x^2}{\sqrt{a^2 - x^2}}\,dx = \int \frac{a^2\sin^2\theta}{a\cos\theta}\, a\cos\theta\, d\theta$$

$$= a^2 \int \sin^2\theta\, d\theta$$

$$= a^2\left[\frac{\theta}{2} - \frac{\sin 2\theta}{4}\right] + C$$

$$= a^2\left[\frac{1}{2}\sin^{-1}\frac{x}{a} - \frac{1}{4}\cdot 2\sin\theta\cos\theta\right] + C$$

$$= a^2\left[\frac{1}{2}\sin^{-1}\frac{x}{a} - \frac{1}{2}\cdot\frac{x}{a}\cdot\frac{\sqrt{a^2 - x^2}}{a}\right] + C$$

$$= \frac{a^2}{2}\sin^{-1}\frac{x}{a} - \frac{x}{2}\sqrt{a^2 - x^2} + C$$

13) i) $\int_0^{\infty} \frac{4x^3}{x^4+1}dx = \lim_{b\to\infty}\int_0^b \frac{4x^3}{x^4+1}dx = \lim_{b\to\infty} \ln(x^4+1)\,\Big|_0^b = \lim_{b\to\infty} (\ln(b^4+1) - \ln 1) = \infty$

ii) $\lim_{b\to\infty}\int_{-b}^b \frac{4x^3}{x^4+1}dx = \lim_{b\to\infty} \ln(x^4+1)\,\Big|_{-b}^b = \lim_{b\to\infty} (\ln(b^4+1) - \ln(b^4+1)) = \lim_{b\to\infty} 0 = 0$

14) The only way the limit of the integral can exist is if the limit of the function is zero.

15) $n \ge 15$

16) $n \ge 37$

17) 0.56569 (Answers may vary slightly.)

18) The mistake is in the second to last step: $\lim_{b\to\infty} [\ln(x-1)]_2^b - \lim_{b\to\infty} [\ln x]_2^b = \ln\infty - \ln\infty + \ln 2 = \ln 2$

19) $|E_T| \le \frac{1}{75}$

20) Infinity cannot be added like this.

21) $u = x^n$, $dv = \sinh ax$

$du = nx^{n-1}dx$, $v = \frac{1}{a}\cosh ax$

$\int u\,dv = uv - \int v\,du$

$$\int x^n \sinh ax\,dx = x^n \cdot \frac{1}{a}\cosh ax - \int \frac{1}{a}\cosh ax \cdot nx^{n-1}dx$$

$$= \frac{x^n}{a}\cosh ax - \frac{n}{a}\int x^{n-1}\cosh ax\,dx + C$$

22) (a) $\int_2^{\infty} e^{-2x}dx = \lim_{b\to\infty}\int_2^b e^{-2x}dx = \lim_{b\to\infty} -\frac{1}{2}e^{-2b} + \frac{1}{2}e^{-4} = \frac{1}{2}e^{-4} < 0.0092$

(b) Since $0 < e^{-x^2} \le e^{-2x}$ for $x \ge 2$, $\int_2^{\infty} e^{-x^2}dx \le \int_2^{\infty} e^{-2x}dx$. So $\int_2^{\infty} e^{-x^2}dx < 0.0092$. Therefore, $\int_0^{\infty} e^{-x^2}dx = \int_0^2 e^{-x^2}dx + \int_2^{\infty} e^{-x^2}dx \approx \int_0^2 e^{-x^2}dx$, with an error of magnitude no greater than 0.0092.

23) Answers will vary, but $f(x) = \frac{1}{(x-c)^d}$ where $a < c < b$ and d a positive integer is a family of examples.

24) $\int_{-\infty}^3 \frac{dx}{1+x^2} + \int_3^{\infty}\frac{dx}{1+x^2} = \int_{-\infty}^5 \frac{dx}{1+x^2} - \int_3^5 \frac{dx}{1+x^2} + \int_3^5 \frac{dx}{1+x^2} + \int_5^{\infty} \frac{dx}{1+x^2} = \int_{-\infty}^5 \frac{dx}{1+x^2} + \int_5^{\infty}\frac{dx}{1+x^2}$

25) Yes, the function is symmetric about the y–axis.

26) $dv = x^n$, $u = \tan^{-1} ax$

$du = \frac{a}{1+a^2x^2}dx$, $v = \frac{x^{n+1}}{n+1}$

$\int u\,dv = uv - \int v\,du$

$$\int x^n\tan^{-1} ax\,dx = \frac{x^{n+1}}{n+1}\tan^{-1} ax - \int \frac{x^{n+1}}{n+1}\cdot\frac{a}{1+a^2x^2}dx + C$$

$$= \frac{x^{n+1}}{n+1}\tan^{-1} ax - \frac{a}{n+1}\int\frac{x^{n+1}}{1+a^2x^2}dx + C$$

27) a) $2 + \frac{\pi}{2}$

b) $|E_T| \le \frac{\pi^3}{3072}\left(1 + \frac{\pi}{4}\right) \le 0.0181$

The actual error will be substantially smaller than this as the upper bound for $|f''(x)|$ is too large.

c) Improved upper bound for $|f''(x)|$ on $[0, \pi/2]$ is 2.299.

Using this upper bound for $|f''(x)|$, $|E_T| \le 0.0116$

d) 0.562527

e) $|E_T| = 0.00827$

f) The actual error is somewhat smaller then the estimate in part c) and is substantially smaller than the estimate in part b).

28) $x = a\sin\theta$

$dx = a\cos\theta\,d\theta$

$\sqrt{a^2 - x^2} = \sqrt{a^2 - a^2\sin^2\theta} = \sqrt{a^2(1 - \sin^2\theta)} = \sqrt{a^2\cos^2\theta} = a\cos\theta$

$$\int \frac{\sqrt{a^2 - x^2}}{x^2}\,dx = \int \frac{a\cos\theta}{a^2\sin^2\theta}\,a\cos\theta\,d\theta$$

$$= \int \cot^2\theta\,d\theta$$

$$= -\theta - \cot\theta + C$$

$$= -\sin^{-1}\frac{x}{a} - \frac{\cos\theta}{\sin\theta} + C$$

$$= -\sin^{-1}\frac{x}{a} - \frac{\sqrt{1 - (x/a)^2}}{x/a} + C$$

$$= -\sin^{-1}\frac{x}{a} - \frac{\sqrt{a^2 - x^2}}{x} + C$$

29) (a) Possible answer:

Note that $\int_0^{\infty}\frac{dx}{x^3+1} = \int_0^1 \frac{dx}{x^3+1} + \int_1^{\infty}\frac{dx}{x^3+1}$.

Since $\int_0^1 \frac{dx}{x^3+1}$ is a proper integral and $\int_1^{\infty}\frac{dx}{x^3+1}$ converges by direct comparison to $\int_1^{\infty}\frac{dx}{x^3}$, $\int_0^{\infty}\frac{dx}{x^3+1}$ converges.

(b) $\int_{50}^{\infty}\frac{dx}{x^3+1} \le \int_{50}^{\infty}\frac{dx}{x^3} = 0.0002$.

(c) 0.0002

(d) 1.209

(e) diverges

30) The error for the Trapezoidal Rule satisfies $|E_T| \le \frac{M(b-a)^3}{12n^2}$, where M is an upper bound on the second derivative of f(x) on the interval [a, b].

In this case $f(x) = 3x - 7$. Since f(x) is a linear function, $f''(x) = 0$ for all x. So $|E_T| \le 0$, or $|E_T| = 0$. Therefore, the Trapezoidal Rule gives the integral's exact value. This makes sense because for a linear function, the trapezoids fit the graph perfectly.

31) (a) $\frac{1}{x+2} + \frac{2}{x-5}$

(b) $\ln|x+2| + 2\ln|x-5| + C$

(c) $2x + \ln|x+2| + 2\ln|x-5| + C$

(d) $y = 2(x+2)(x-5)^2$

32) $u = x^n$, $dv = b^{ax}$

$du = nx^{n-1}dx$, $v = \frac{b^{ax}}{a\ln b}$

$\int u\,dv = uv - \int v\,du$

$$\int x^n b^{ax}dx = x^n\cdot\frac{b^{ax}}{a\ln b} - \int\frac{b^{ax}}{a\ln b}\cdot nx^{n-1}dx$$

$$= \frac{x^n b^{ax}}{a\ln b} - \frac{n}{a\ln b}\int x^{n-1}b^{ax}dx + C$$

33) The error for Simpson's Rule satisfies $|E_S| \le \frac{M(b-a)^5}{180n^4}$, where M is an upper bound on the fourth derivative of f(x) on the interval [a, b].

Since f(x) is a cubic function in this case, $f^{(4)}(x) = 0$ for all x. So $|E_S| \le 0$, or $|E_S| = 0$. Therefore, Simpson's Rule gives the integral's exact value.

34) (a) The integral converges if $p < 1$.

(b) The integral diverges if $p \ge 1$.

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