1. Find the radius and the interval of convergence of the power series

$$\sum_{n=0}^{\infty} \frac{(3x+1)^n}{2n+2}$$

2. Using series, evaluate the limit

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$$\lim_{x \to 0} \frac{7\sin x}{e^{2x} - 1}$$

3. Use power series to approximate

$$\int_{0}^{1/2} \frac{x}{1+x^5} dx$$

4. The planes 3x + 6z = 1 and 2x + 2y - z = 3 intersect in a line .

 $a.\ (5\ \mathrm{pts.})$ Show that the planes are perpendicular.

 $b.~(15~\mathrm{pts.})$ Find the parametric equations for the line of intersection.

5. (a) (10 pts.) Find the equation for the tangent plane at the point $P_0(0,1,2)$ to the surface $\cos \pi x - x^2y + e^{xz} + yz = 4$.

 $(b)~(10~{\rm pts.})\,$ Find the distance from the point P~(1,1,3) to the plane ${\cal P}\,$ (found in (a)).

6. (a) (10 pts.) Let $f(x,y) = \arccos(xy) + y^x$ where $x = \sec(te^s)$ and $y = \ln(t^4 + 3s^2)$. Find $\frac{\partial f}{\partial t}, \frac{\partial f}{\partial s}$.

(b) (10 pts.) Let $w = f\left(x^3 - 2y^2, \frac{x}{y}\right)$ where $f_1(6, 2) = 3$ and $f_2(6, 2) = -2$. Find w_x and w_y at the point where x = 2, y = 1.