1. Find the interval and radius of convergence for each of the following

   a. $\displaystyle\sum_{k=0}^{\infty} \frac{10^k x^{2k}}{k!}$

   b. $\displaystyle\sum_{k=1}^{\infty} \frac{(x-1)^k}{k3^k}$

   c. $\displaystyle\sum_{k=0}^{\infty} \frac{(2x-1)^k}{k^2+1}$

2. Find the Taylor Series for each of the following

   a. $f(x) = \sin x$ and $x = \pi/2$.

   b. $f(x) = \dfrac{1}{(x-4)^2}$ for $x = 5$

   c. $f(x) = \dfrac{1}{3x-2}$ at $x = 2$.

3. Given that $e^x = \displaystyle\sum_{k=0}^{\infty} \frac{x^k}{k!}$ and $\sin x = \displaystyle\sum_{k=0}^{\infty} \frac{(-1)^k x^{2k+1}}{(2k+1)!}$, find the power series for each of the following.

   a. $g(x) = x^2 e^{3x}$

   b. $g'(x)$

   c. $\displaystyle\int \frac{\sin x}{x}\, dx$

   d. $\displaystyle\int \frac{e^x - 1}{x}\, dx$

4. For the parametric curve $x = t^2 + 4$, $y = 2 - t$ for $-4 \leq t \leq 4$

   a. Eliminate the parameter to obtain an equation in x and y.

   b. Graph the curve.

5. Find an equation of the line tangent to the cycloid $x = t - \sin t$, $y = 1 - \cos t$ at $t = \pi/6$.

6. Plot the point with polar coordinates $(2, 5\pi/6)$, then find the Cartesian coordinates of the points.

7. For the point with Cartesian coordinate $(-\sqrt{3}, 3)$:

   a. Find the polar coordinates (r, θ) of the point where $r > 0$ and $0 \leq \theta < 2\pi$.

   b. Find the polar coordinates (r, θ) of the point where $r < 0$ and $0 \leq \theta < 2\pi$.

8. Replace the Cartesian equation by the equivalent polar equation.
   a. $x + y = 4$
   b. $(x-5)^2 + y^2 = 25$

9. Replace the polar equation by the equivalent Cartesian equation. Then describe or identify each.
   a. $r = 4\csc\theta$
   b. $r = 8\cos\theta - 10\sin\theta$

10. Write the equation of the tangent line to the curve $r = 1 + \sin\theta$ at $\theta = \dfrac{3\pi}{4}$.

11. Graph the polar equation
    a. $r = 4\sin\theta$
    b. $r = 2 + 2\cos\theta$
    c. $r = 5\cos 3\theta$

12. Find the area that lies inside both curves $r = \sin 2\theta$ and $r = \sin\theta$.

13. Find the area of the region enclosed by the inner loop of $r = \dfrac{1}{2} - \cos\theta$. Set up the integral but do not evaluate.