1–11 Use power series to solve the differential equation.

1. $y' - y = 0$
2. $y' = xy$
3. $y' = x^2 y$
4. $(x - 3)y' + 2y = 0$
5. $y'' + xy' + y = 0$
6. $y'' = y$
7. $(x^2 + 1)y'' + xy' - y = 0$
8. $y'' = xy$
9. $y'' - xy' - y = 0, \quad y(0) = 1, \quad y'(0) = 0$
10. $y'' + x^2 y = 0, \quad y(0) = 1, \quad y'(0) = 0$
11. $y'' + x^2 y' + xy = 0, \quad y(0) = 0, \quad y'(0) = 1$
12. The solution of the initial-value problem

$$x^2 y'' + xy' + x^2 y = 0 \qquad y(0) = 1 \qquad y'(0) = 0$$

is called a Bessel function of order 0.

(a) Solve the initial-value problem to find a power series expansion for the Bessel function.

(b) Graph several Taylor polynomials until you reach one that looks like a good approximation to the Bessel function on the interval $[-5, 5]$.