

1. Given the differential equation $y'' - xy' - y = 0$, assume the solution can be written in the form of the series about $x_0 = 1$, and find the recurrence relation for the coefficients. Then find the first three non-zero terms of two independent solutions (y_1 and y_2).

2. Determine a lower bound for the radius of convergence of a series solution about each x_0 for the differential equation $(x^2 - 2x - 3)y'' + xy' + 4y = 0$.

a. $x_0 = 4$

b. $x_0 = -4$

3. Determine a lower bound for the radius of convergence of a series solution about each x_0 for the differential equation $(1 + x^2)y'' + 2xy' + 4x^2y = 0$.

a. $x_0 = 0$

b. $x_0 = -\frac{1}{2}$