

Math 240 - Assignment 8

October 22, 2026

Name _____

Score _____

Show all work to receive full credit. Supply explanations when necessary. This assignment is due October 29.

1. Find the first six nonzero terms of the power series solution centered at $x = 0$.

$$(x - 3)y' + y = 0$$

Based on the pattern in your solution, write the power series solution as an infinite sum in summation notation.

2. Find the first six nonzero terms of the power series solution centered at $x = 0$.

$$(x + 5)y' + y = 0$$

Based on the pattern in your solution, write the power series solution as an infinite sum in summation notation.

3. State the recurrence relation that describes the coefficients of the power series solution, and state the guaranteed radius of convergence (according to our theorem).

$$(x^2 - 3)y'' + 2xy' = 0$$

4. Find the first four nonzero terms of the power series solution centered at $x = 0$.

$$y'' + 3xy' - y = 0; \quad y(0) = 2, \quad y'(0) = 0$$

5. State the recurrence relation that describes the coefficients of the power series solution, and state the guaranteed (by our theorem) radius of convergence.

$$5y'' - 2xy' + 10y = 0$$

6. Consider the following first-order linear equation.

$$x^3y' = 2y$$

- (a) Find a power series solution centered at $x = 0$.
- (b) Use the techniques of section 1.5 to find the general solution.
- (c) Compare your solutions. Why did the power series approach fail to provide the general solution?

7. For each equation below, consider a power series solution of the form $y(x) = \sum_{n=0}^{\infty} a_n x^n$.

Determine the minimum radius of convergence that is guaranteed by the theorem we discussed in class.

(a) $(x + 4)y'' + 7xy' - 5(x + 2)y = 0$

(b) $(x^2 + 1)y'' + 8y' + (x^2 - 1)y = 0$