

## HOMEWORK # 8, DUE FEBRUARY 28

**Problem 1** (4 points each)

Solve the following differential equations by means of a power series about the point  $x_0 = 0$ . Find the recurrence relation and the first four terms in each of two linearly independent solution. What do you expect for the radius of convergence of the solution?

(1)  $(2 + x^2)y'' - xy' + 4y = 0.$

(2)  $y'' + \sin(x)y = 0.$

(3)  $\cos(x)y'' + xy' - 2y = 0.$

**Problem 2** (3 points each)

Problems 17, 18, 20 on page 266.

**Problem 3** (3 points each)

For the following differential equations find all the singular points and determine for each singular point whether it is regular or not.

(1)  $xy'' + (1 - x)y' + 2xy = 0$

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

(3)  $x^2(1 - x^2)y'' + (2/x)y' + 2y = 0.$

**Problem 4** (4 points each)

For the following differential equations determine the general solution of the given differential equation, which is valid in any interval not including the singular point.

(1)  $x^2y'' - 5xy' + 9y = 0$  (Problem 11, page 278).

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

(3)  $x^2y'' - xy' + 4y = 0.$

(4)  $(x - 1)^2y'' + 5(x - 1)y' + 8y = 0.$  (Hint: Make a change of variables  $\tilde{x} = x - 1$ , then find the solution as we did in class.

When you have the solution, change the variable back. If you are lost, you can compare it to Problem 10 on page 278, but be careful, it is not exactly the same problem.)

**Problem 5** (4 points)

Problem 19 on page 278.

**Bonus** (10 points)

Problem 10 on page 265.