## Math 2233 Homework Set 9

After working out these problems, upload your solutions to Canvas. (Go to the Assignments tab on our Canvas homepage to upload your answers.)

YOU MUST SHOW YOUR CACULATIONS IN FULL DETAIL FOR FULL CREDIT.

1. Transform each of the following expressions into a single power series.

(a) 
$$\sum_{n=1}^{\infty} (n+1)(x-1)^{n-1} + \sum_{n=0}^{\infty} n(x-1)^n$$
  
(b)  $\sum_{n=0}^{\infty} (n+1)a_{n+2}x^{n+1} + \sum_{n=0}^{\infty} na_n x^{n-1}$   
(c)  $(x-1)\sum_{n=0}^{\infty} na_n x^{n-1} + \sum_{n=0}^{\infty} a_n x^n$   
(d)  $x \sum_{n=0}^{\infty} na_n (x-1)^{n-1} + \sum_{n=0}^{\infty} a_n (x-1)^n$   
(e)  $x^2 \sum_{n=0}^{\infty} n(n-1)a_n (x-1)^{n-2}$ 

2. Find the recursion relations for the power series solutions  $y(x) = \sum_{n=0}^{\infty} a_n (x - x_o)^n$  of the following differential equations

(a) 
$$y'' - xy' - y = 0, x_o = 0$$
  
(b)  $y'' - xy' - y = 0, x_o = 1$   
(c)  $(1 - x)y'' + y = 0, x_o = 0$   
(d)  $y'' + xy' + 2y = 0, x_o = 0$   
(e)  $(1 + x^2)y'' - 4xy' + 6y = 0, x_o = 0$ 

3. Find power series expressions for the general solutions of the following differential equations. (You may utilize recursion relations found in Problem 2.)

(a) 
$$y'' - xy' - y = 0, x_o = 0$$
  
(b)  $y'' - xy' - y = 0, x_o = 1$ 

4. Find power series expressions for the solutions to the following initial value problems. (You may utilize recursion relations found in Problem 2.)

(a) (1-x)y'' + y = 0, y(0) = 2, y'(0) = 1(b) y'' - xy' - y = 0, y(1) = 1, y'(1) = 2