Math 2233
Homework Set 8

1. Determine the lower bound for the radius of convergence of series solutions about each given point x_o.

(a) $y'' + 4y' + 6xy = 0$, $x_0 = 0$
(b) $(x-1)y'' + xy' + 6xy = 0$, $x_0 = 4$
(c) $\left(4 + x^2\right) y'' + 4xy' + y = 0$, $x_0 = 0$
(d) $\left(1 + x^2\right) y'' + 4xy' + y = 0$, $x_0 = 2$

2. Determine the singular points of the following differential equations and state whether they are regular or irregular singular points.

(a) $xy'' + (1-x)y' + xy = 0$
(b) $x^2(1-x)^2y'' + 2xy + 4y = 0$
(c) $(1-x^2)^2y'' + x(1-x)y' + (1+x)y = 0$

3. The following differential equation has a regular singular point at $x = 0$. Determine the indicial equations, the roots of the indicial equations, the recursion relations, and the first four terms of two linearly independent series solutions.

$$2xy'' + y' + xy = 0 \quad .$$

4.The following differential equation has a regular singular point at $x = 0$. Determine the indicial equation and the recursion relations corresponding to the largest root of the indicial equation. Write down the first four terms of the corresponding solution.

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