Math 217 - December 3, 2010

1. Let $p_0 = 1$ and $q_0 = -1$.

   (a) Solve the equation for r: $r(r-1) + p_0 r + q_0 = 0$.

   (b) For each solution, verify that x^r is a solution to

   $$x^2 y'' + x p_0 y' + q_0 y = 0$$

2. Let $p_0 = 1$ and $q_0 = -9$.

   (a) Solve the equation for r: $r(r-1) + p_0 r + q_0 = 0$.

   (b) For each solution, verify that x^r is a solution to

   $$x^2 y'' + x p_0 y' + q_0 y = 0$$

3. Let $p_o = 3$ and $q_0 = -8$.

   (a) Solve the equation for r: $r(r-1) + p_0 r + q_0 = 0$.

   (b) For each solution, verify that x^r is a solution to

   $$x^2 y'' + x p_0 y' + q_0 y = 0$$

4. Let $p_0 = 3/2$ and $q_0 = -1/2$.

   (a) Solve the equation for r: $r(r-1) + p_0 r + q_0 = 0$.

   (b) For each solution, verify that x^r is a solution to

   $$x^2 y'' + x p_0 y' + q_0 y = 0$$

Lecture Problems

5. Determine if $x = 0$ is an ordinary point, a regular singular point or an irregular singular point for the equations. If the singular point is regular, find p_0, q_0 and the exponents.

   (a) (Bessl's equation) $x^2 y'' + xy' + (x^2 - n^2)y = 0$

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

   (c) $(x \sin x)y'' + (\cos x)y' + e^x y = 0$

   (d) $2x^2 y'' + 3xy' - (x^2 + 1)y = 0$

6. Using the root $r = -1$, find the Frobenius series solution to

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