**Math 250b (Spring '08) - Homework 6**

1. Consider the differential equation and initial condition

$$y' + y = 2, \quad y(0) = 1$$

(a) Find a power series solution about 0.
(b) Solve the equation analytically and compare the power series of your solution with your answer to part (a).

2. Consider the differential equation and initial condition

$$y' = xy, \quad y(0) = 1$$

(a) Find a power series solution about 0.
(b) Solve the equation analytically and compare the power series of your solution with your answer to part (a).

3. Consider the *second order* differential equation and initial conditions

$$y'' + y = 0, \quad y(0) = 1, \quad y'(0) = 0$$

(a) Find a power series solution about 0.
(b) You should recognize your solution as the power series of one of your favorite functions. What is it?

4. Consider the differential equation and initial conditions

$$y' + \frac{y}{x} = x, \quad y(1) = 1$$

Note that you cannot find a power series solution about 0 since $1/x$ does not have a power series about 0.
(a) Find a power series solution about $a = 1$.
(b) Solve the equation analytically and compare the power series about $a = 1$ of your solution with your answer to part (a).