PHYS 301
HOMEWORK #9

Due : 4 April 2012

1. Boas 9 - 24 p. 371 Boas.

For problems 2 - 4, determine the recursion relation for each differential equation and write the first three non-zero terms of the solution. If there are two branches of the solution, (as in an a_0 and an a_1 branch) write the first three non-zero terms of each branch. You may use *Mathematica* to verify solutions, but you are required to show all your work in determining the recursion relation for each equation.

2. $y'' + x\,y = 0$

3. $y'' - 2\,x\,y' - 2\,y = 0$

4. $y'' - x^2 y' - y = 0$

5. Consider the differential equation :

$$(y')^2 - y = x \quad \text{with the boundary conditon } y(0) = 1$$

Find the solutions to this differential equation using power series. Recall that a quadratic equation has two solutions; one is quite simple, the other more complex. For this problem, it is likely best to write your assumed solution in the explicit form :

$$y = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4 + a_5 x^5 + \ldots$$

and find the individual coefficients by equating the two sides of the equation. Find both solutions to this equation. One solution will truncate quickly, find the other solution out to the x^5 term. You may use *Mathematica* to help you determine the values of the coefficients.