Homework#4 (Math 342)

(due Wed Oct 31)

Z: Advanced Engineering Mathematics , by D. G. Zill (6th Edition)

Note: Detail your work to receive full credit. In the following problems, whenever possible, look for power series solutions about $x_0 = 0$.

Sec. 5.1 (Z): 21, 24 (for each problem, write out the first three nonzero terms in each of the two linearly independent power series).

Additional problems:

1) Solve the following 1st-order differential equations by the power series method. Determine the radius of convergence and write out the first four nonzero terms in the resulting series.

(a) $y' = x^2 y$

(b) $2(x+1)y' = y$

2) Solve the following 2nd-order differential equations by the power series method. Determine the radius of convergence and split the solution into two linearly independent power series. Write out the first four nonzero terms in each of these series.

(a) $y'' + y = x$

(b) $y'' + xy' + y = 0$

(c) $(x^2 - 1)y'' + 8xy' + 12y = 0$

3) Solve the following initial value problem by the power series method

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

Write out the first three nonzero terms in the resulting series. Here you do not need to split the solution into two linearly independent components.