Assignment #8

Due *Thursday, 17 November, 2005.*

I. I will eventually get to linear algebra (Chapter 8). I will only get to complex analysis (Chapter 20) next semester; this is the most significant modification of the plan in described in the syllabus. For now we might as well continue with series solutions of ODEs because they naturally continue the material we have been just doing.

II. Read sections 16.1, 16.2, 16.3, and 16.4 of RILEY, HOBSON, & BENCE. In this quick assignment I am only asking you to deal with *ordinary* points.

III. Do the following exercises:

Exercise E. Use series methods to find the general solution to

$$y'' + y' - 6y = 0.$$

(In this easy case you should be able to recognize the elementary functions which appear!)

Exercise F. Use series methods to solve *Airy's* equation

$$\ddot{y} + ty = 0.$$

In particular, find *the* series for the solution satisfying $y(0) = 1$ and $\dot{y}(0) = 0$. For this series, use MATLAB or any other computer system to plot the $N = 3, 6, 10, 20, 30, 40, 50$ partial sums on the same axes; a plotting range of $-3 < t < 10$ and $-3 < y < 3$ should produce a reasonable picture. Try to plot the actual solution on the same axes and plotting range. Finally, find a reference that explains how this (and other appropriately defined) *Airy* functions are actually computed for a large range of t; briefly paraphrase what your source says about practical, accurate evaluation of these and closely-related special functions. In particular, how, if at all, are power series solutions of the ODE actually used?

HINT: *Numerical Recipes* is free online at

`http://www.library.cornell.edu/nr/`

IV. Do exercises from RILEY, HOBSON, & BENCE:

16.1, 16.4, 16.10.