Physics 430, Winter 2009
Take-Home Problem #1
29 January 2009
due 5 February 2009

Solve the following two problems in Matlab. Email a copy of your scripts to Dr. Peterson (bryan_peterson@byu.edu) by 5:00 pm on the due date.

This problem is open notes (code, lab manual, matlab book, etc.) but is closed lab partner and closed lab TA. You are expected to do your own work but you are allowed to reuse appropriate code from previous exercises.

1. The following sum is a mathematical result that appears in mathematical handbooks:

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(2n-1)^3} = \frac{\pi^3}{32}$$

Use this formula and a Matlab loop to compute π to 12 decimal places.

2. Use Matlab to solve the following differential equation with the indicated boundary conditions:

$$(1+x^3)f''(x) + e^{-x^2}f'(x) + \frac{50f(x)}{1+x^2} = x^2 \qquad f(0) = 1 \qquad f(1) = -2$$

Plot your result from $x = 0$ to $x = 1$ on a grid fine enough to determine $f(0.5)$ to 3 significant figures and tell what this value is.