Math 3310/6310 Homework Assignment 3 Due Feb. 13, 2017

1. Write comments for each line of the function `mystery.m` that explain what each line does.

2. Use Newton's method with $x_0 = 0.8$ to find a root of the function

$$f(x) = \frac{1}{2} + \frac{1}{4}x^2 - x\sin(x) - \frac{1}{2}\cos(2x)$$

   within 10^{-5}. Compute the order of convergence and explain what is happening.

3. The polynomial $P(x) = x^3 - 7x^2 + 14x - 5$ has one real root and two complex roots.

   (a) Use Newton's method to find all the roots. You may try an *imaginary* initial guess to find the complex roots.

   (b) Use the program `muller.m` to find the root.

   (c) Compare the two methods.

4. Consider the function $f(x) = 2e^{-(x-1)^2} + e^{-3x^2}$. Plot the function and find the value of x up to 7 decimal places where this function has a maximum.

5. Plot the polynomial $f(x) = x^2 + x + 1$. Find the roots of this polynomial to within a tolerance of 10^{-6}. Show and explain what happens with some of your unsuccessful attempts.