Math 611, Homework # 3

Math 611, Fall 2013
Show all your work. Due in class on October 1, 2013.

1. Problem 1 (50 points).

   Let $f(x) = 1/(1+x^2)$ for $-5 \leq x \leq 5$. Let $n > 0$ be an even integer, and define $h = 10/n$ and $x_j = -5+jh$, with $j = 0, 1, 2, ..., n$. Use interp.m (web.njit.edu/∼yyoung/M611/interp.m, and web.njit.edu/∼yyoung/M611/divdif.m) to compute the n-th order interpolating polynomial and compare it against $f(x)$ for three values of n: $n = 4$, $n = 16$, and $n = 24$ by plotting them together. Label all curves, including the axes. Show all your work.

2. Problem 2 (50 points).

   Use Newton's method to calculate the roots of

   $$f(x) = x^5 + 0.9x^4 - 1.62x^3 - 1.458x^2 + 0.6561x + 0.59049.$$

   Print out the iterates x_n and the function values $f(x_n)$. Produce the ratios of equation (3.62) (page 110) by using the approximation of equation (3.65) (page 111). Repeat the problem for several choices of x_0. Make observation that seem important relative to the root-finding problem.