

# MATH 435

Spring 2009

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## Homework #2

Due: February 13, 2009

1. The polynomial  $P_8(x) = x^8 + 2x^7 + x^6 + 2x^5 + 5x^3 + 7x^2 + 5x + 7$  has a pair of complex-conjugate zeros  $x = \pm i$ . Approximate them using Muller's method. (*Do three iterations*) Choose  $x_0 = 0, x_1 = 0.1, x_2 = 0.5$ .
  
2. The polynomial  $P_6(x) = 3x^6 - 7x^3 - 8x^2 + 12x + 3 = 0$  has a double root at  $x = -1$ . Approximate this root first by using standard Newton's method and then by two modified Newton's methods, starting  $x_0 = -0.5$ .  
  
Use Horner's method to find the polynomial value and its derivative at each iteration. Present your results in tabular form. (*Do three iterations.*)
  
3. Starting with  $x_0 = 0$ , and  $x_1 = 0.5$ , generate a set of approximations  $\{x_2, \dots, x_k, x_{k+1}, \dots\}$  until  $|x_{k+1} - x_k| < 0.0005$  to find a zero of  $f(x) = \tan(x) - x$ , based on fixed point iteration. Then compute  $\{\hat{x}_k\}$  using Aitken's acceleration scheme. Compare how convergence is improved. Check if the convergence is improved by Aitken's scheme if Newton's method is used in place of fixed-point iteration.