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Math128A: Numerical Analysis
Programming Assignment #1, Due Oct. 1, 2008

Consider the cubic equation

$$ax^3 + bx^2 + cx + d = 0, \tag{1}$$

where $a \neq 0$, b, c, and d are constants.

1. To solve equation (1) numerically, for each of the bisection method, Newton's method, and the Muller's method, you should:
   (a) First compute a root of equation (1);
   (b) Use deflation procedure to reduce equation (1) to a second order equation.
   (c) Solve the second order equation.
2. Submit one Matlab functions that perform the above calculation for each method. Each function should take as input a column vector $[a\ b\ c\ d]^T$ and output the roots of the polynomial $at^3 + bt^2 + ct + d$ in the form of a column vector. The beginning of your file should have several lines commented out containing your name and section number, and explaining the what your function does. Also submit a report on the success of your functions. For example, you should evaluate the polynomial at the roots you have found to check if it is close to 0. In particular, check to see how large the residual error is, where residual error is

$$E_r = \frac{ar^3 + br^2 + cr + d}{|ar^3| + |br^2| + |cr| + |d|}$$

   Send the three matlab *.m files along with the report together (in one email) to sarm@math.berkeley.edu by 11:59 pm on October 1, 2008.