HW 4

Due in CMS by 9:00 am on Wednesday, March 9

1: Look ma, no division! In class, we discussed using Newton's iteration to compute a reciprocal $1/d$ using only additions and multiplications.

1. Derive a similar Newton algorithm to compute the reciprocal square root $x = 1/\sqrt{d}$ using only addition, subtraction, multiplication, and division by two.

2. To test your program, iterate to $\sqrt{1/2}$ starting from the initial guess $x_0 = 1/2$. Plot the size of the absolute error as a function of the iteration up to convergence. How many steps does it take to get $1/\sqrt{2}$ to machine precision?

2: Sine of the times. Write a MATLAB function to find *all* positive solutions to

$$\sin(x) - bx = 0$$

for $b > 10^{-2}$. You should strive for a relative accuracy of at least three digits. You may use any MATLAB functions, including `fzero`, which includes a sophisticated combination of bisection and secant iteration. A sketch may help you figure out a solution to get reasonable bracketing intervals. When is it hard to find the largest solution?