**Reading Assignment:** Read Moler Section 4.2 on Newton’s method & Sections 7.1–7.2, & 7.4 on ordinary differential equations. Keep reading the “UNIX Tutorial for Beginners” (Intro–Tutorial 3) & the “C Programming Notes” (Chapters 1–6).

**Homework 2**

Due: Fri Feb 5

(1) Compile & run the program arith.c & turn in the output annotated with a phrase describing what each output line means.

(2) Find a positive root of

\[ g(x) = \exp(-x^2) - \frac{1}{1 + 4x^2} = 0 \]

using newton.c. (a) Take the initial guess to be \( x = 1 \). Turn in just the output of newton.c. (b) What goes wrong with the initial guess \( x = 2 \)?

(3) Verify the formulas for \( u_{FE} \), \( u_{BE} \), & \( u_{TR} \) in BE_TR.c for \( u' = -u \), starting from the standard form for the difference methods:

\[
\begin{align*}
    u_{n+1} &= u_n + \Delta t \ f(u_n) \quad \text{(Forward Euler)} \\
    u_{n+1} &= u_n + \Delta t \ f(u_{n+1}) \quad \text{(Backward Euler)} \\
    u_{n+1} &= u_n + \frac{\Delta t}{2} \ (f(u_n) + f(u_{n+1})) \quad \text{(TR)}
\end{align*}
\]