MATH 340 - Lab Instructor: Valeria Barra
LAB 4 Assignment
DUE Tuesday 02-16-2016

Root-finding: Secant Method

To find the root of a function of the form $f(x) = 0$, the secant iterative method is:

$$x_{n+1} = x_n - \frac{f(x_n)(x_n - x_{n-1})}{f(x_n) - f(x_{n-1})} \qquad , \; n \geq 1$$

Note that this is a two-step method, therefore we need two initial guesses for our solution: x_0 and x_1.

A variation: Regula Falsi

Since the Secant Method does not guarantee the bracketing of the solution (as it was for Bisection Method), it may migrate away from it. Hence, we present here a variation which takes care of bracketing at each step: the Regula Falsi. This could be seen as a mashup of the Bisection Method and the Secant Method. In fact, it consists in taking one step of Secant Method to find the new intermediate value, called c in the Bisection Method, and just continue with the Bisection Method algorithm. The *pseudo-code* is given in your textbook.

To define the error, once again we can use as an estimate the difference in absolute value of two consecutive approximations $err_n = |x_{n+1} - x_n|$

Problem 1:
Do Problem 28 of your homework. Write a one sentence conclusion comparing the number of steps needed with bisection, Newton, secant and regula falsi.

Problem 2:
Do Problem 29 of your homework. Write a one sentence conclusion comparing the number of steps needed with bisection, Newton, secant and regula falsi.