MECHANICAL ENGINEERING

USF UNIVERSITY OF SOUTH FLORIDA

EML3035
Programming Concepts for Mechanical Engineers

Homework: Secant Method

Follow the same format as given at
http://www.eng.usf.edu/~kaw/class/EML3035/homework/sample_homework.htm
where you need to look under
Sample HW for assignments **HW#1**

What to Submit
The sequence of items attached needs to be as follows
- Affidavit Sheet
  http://www.eng.usf.edu/~kaw/class/EML3035/Independent_affidavit_sheet.pdf
- Pseudo-code for the program
- Published mfiles (for each of the three sets of inputs)

Background
The secant method is used to approximate the value of the root(s) of an equation $f(x)=0$.
The secant method requires the user to make two initial guesses x_0 and x_1 of the root of the equation, but which do not necessarily need to bracket the root. The secant method iterative formula is given by

$$x_{k+1} = x_k - \frac{x_k - x_{k-1}}{f(x_k) - f(x_{k-1})} f(x_k), \; k = 2, 3, ... \qquad (1)$$

where

$\quad\quad x_{k+1}$ is the current approximation,

$\quad\quad x_k$ is one of the previous approximations,

$\quad\quad x_{k-1}$ is the other previous approximation.

This process is repeated until the root is found.

The absolute approximate error $|E_a|$ is defined as

$$\quad |E_a| = |\text{Present Approximation} - \text{Previous Approximation}| \qquad (2)$$

When $|E_a|$ is less than or equal to the prespecified tolerance, E_s, the iterative process is stopped.

To learn more about secant method, visit
http://mathforcollege.com/nm/videos/youtube/03nle/secant/secant_03nle_derivationapproach1.html

Specifications

Write a MATLAB program that uses the secant method to find the approximate root(s) of an equation.

The program inputs are
- function f,
- first two guesses, x(1) and x(2),
- maximum number of iterations to conduct, n, and
- prespecified absolute approximate error tolerance, Es .

The outputs are the
- approximate value of the root of the equation, rootval at the end of the last iteration or when it reaches the prespecified tolerance (whichever comes first),
- how the loop ended (disp 'Loop ended due to reaching prespecified tolerance' or 'Loop ended as maximum iterations were used').

Run the program with 3 sets of inputs that would considered to be good test inputs.

You are asked to use a vector to store the approximations of the root of the equation when using the recursive relationship (1).