Finding Roots of Nonlinear Functions using Bisection

Write a program that finds a root of a nonlinear function $f(x)$. The program should:

- Read the function parameters from a spreadsheet.
- Read guesses for the low and high values of x from the spreadsheet.
- Read the required accuracy for the root from the spreadsheet.
- Define the nonlinear function as a separate subroutine.
- Check that there is a root of the function between the low and high values of x. Use the function subroutine to evaluate the function at each point.
    - If there is no root between these bounds, stop and provide an error message.
- Determine the best accuracy (the smaller error) of the two roots.
- Begin a WHILE loop that continues until the smaller error term is less than the required accuracy. Inside the loop:
    - Calculate the x-value halfway between the two bounds.
    - Calculate the value of the function at the midpoint x.
    - If the root is between the lower value of x and the midpoint value of x,
        - Make the midpoint value of x the new high value of x.
        - Make the midpoint value of the function the new high value of the function.
        - Calculate the smaller error of the two roots.
    - If the root is between the midpoint value of x and the high value of x,
        - Make the midpoint value of x the new low value of x,
        - Make the midpoint value of the function the new low value of the function, and
        - Calculate the smaller error of the two roots.
- End the loop.
- Output the value of x that provides the smaller error value, and output the value of the function for that value of x to the spreadsheet.

For this assignment, the nonlinear function should be the secant formula we used in lecture and lab with E = 30,000,000 psi, L/r = 150, ec/r^2 = 0.75, and find the value of average stress P/A that creates a maximum stress (allowable stress) that is equal to 30,000 psi (similar to what we did in class, but with a higher grade steel providing a higher allowable stress).