

MAE 3210 - Spring 2020 - Homework 2

Homework 2 is due **online** through Canvas in PDF format by 11:59PM on Thursday January 23. These problems should be solved with programming, by calling functions named “Bisection”, “FalsePosition”, “NewtonRaphson”, and “Secant”. You are required to submit code for all functions and/or subroutines built to solve these problems, which is designed to be easy to read and understand, in your chosen programming language, **and which you have written yourself**. The text from your code should both be copied into a single PDF file submitted on canvas. **Your submitted PDF must also include responses to any assigned questions, which for problems requiring programming should be based on output from your code**. For example, if you are asked to find a numerical answer to a problem, the number itself should be included in your submission.

1. Determine the real root of $f(x) = x^5 - 10x^4 + 46x^3 - 90x^2 + 85x - 31$
 - (a) Graphically.
 - (b) Using the bisection method to determine the root with $\varepsilon_s = 10\%$. Employ the initial guesses of $x_l = 0.5$ and $x_u = 1.0$.
 - (c) Perform the same computation as in (b) but use the false position method and $\varepsilon_s = 0.2\%$.
2. Determine the lowest real root of $f(x) = -3x^3 + 20x^2 - 20x - 12$
 - (a) Graphically.
 - (b) Using the bisection method to determine the lowest root with $\varepsilon_s = 2\%$. Employ the initial guesses of $x_l = -1$ and $x_u = 0$.
 - (c) Perform the same computation as in (b) but using the false position method.
3. Textbook problem 5.13.
4. Determine the real roots of $f(x) = 0.5x^3 - 4x^2 + 8x - 1$
 - (a) Graphically.
 - (b) Using the Newton-Raphson method to within $\varepsilon_s = 0.01\%$.
5. Determine all roots of $f(x) = -3x^3 + 20x^2 - 20x - 12$
 - (a) Using the Secant method to a value of ε_s corresponding to three significant figures.