ENG 60104 Computing Applications for Engineers
PALS 1

Answer using hand calculation
Calculation

Question 1
Water is flowing in a trapezoidal channel at a rate of Q=20m^3/s. The critical depth y for such a channel must satisfy the equation

$$0 = 1 - \frac{Q^2}{gA_c^3}B$$

where g=9.81m/s^2, A_c=the cross sectional area (m^2) and B=width of the channel at the surface (m). For this case, the width and the cross-sectional area can be related to depth y by

$$B = 3 + x$$

and

$$A_c = 3x + \frac{x^2}{2}$$

Solve for the criterion depth using the bisection and false position method. The initial guesses for both methods are x_l=0.5 and x_u=2.5. Iterate until the relative error falls below 5%. Then, write the Matlab script for both methods.

Answer: q1.m

Question 2
Determine the root of $f(x) = 0.95x^3 - 5.9x^2 + 10.9x - 6$ using the Newton Raphson method (three iterations, $x_i = 3.5$) and the Secant method (three iterations, $x_{i-1} = 2.5$ and $x_i = 3.5$)

Question 3
Determine the value of x_1, x_2 and x_3 for the following equations using Cramer's rule and Gauss Elimination method.

$$50 = 5x_3 - 7x_2$$
$$4x_2 + 7x_3 + 30 = 0$$
$$x_1 - 7x_3 = 40 - 3x_2 + 5x_1$$