MTP 290—ASSIGNMENT 1

Problem 1 Use Newton's method to find solutions accurate within $1e-5$ for the following problems:
(a) $f(x) \equiv x^3 - 2x^2 - 5 = 0$ on the interval $[1, 4]$.
(b) $f(x) \equiv x\cos(x) = 0$ on the interval $(0, \pi)$.
Plot all x^n over the x-axis and also draw the graph of f(x) in the same figure. Range of x can be specified by you for better visibility.

Problem 2 Use Bisection method for finding the approximations of the two zeros, one in $[-1, 0]$ and other in $[0, 1]$ of $f(x) = 230x^4 + 18x^3 + 9x^2 - 221x - 9$ accurate within $1e-3$. Use secant method with the end points of the interval as initial guesses and discuss the respective results.

Problem 3 Use Newton's method for finding the approximations of the zeros of $f(x) = (x-1)^4(x-5)$ accurate within $1e-7$. How many iterations do you need for the approximation when the starting guess is -10? Do we have a better method for roots of multiplicity greater than 1? If yes, use that and find the number of iteration required for the approximation.

Problem 4 Use the following formula to calculate the order of convergence for Problem 3:

$$p_{n+1} = \frac{\log\left(\frac{\epsilon_{n+1}}{\epsilon_n}\right)}{\log\left(\frac{\epsilon_n}{\epsilon_{n-1}}\right)},\ \epsilon_n = |x^n - x^{n-1}|.$$

Problem 5 Find the smallest positive root of $\cos(x) = \frac{1}{2} + \sin(x)$ using a suitable root finding method. Use $1e-4$ as the tolerance.

Note.

- For each problem, you need to write Matlab codes. Proper documentation should be used in the programs.
- You have to submit all the codes. Please put all programs in a folder and compress it before upload. Name of the file should be: "Ass1_EntryNu".
- No cheating allowed.