Computational Mathematics

Exercises Set: 1 (deadline Jan 15/2022)

1. Find the root to the following equations:

   (a) $e^x - 2x\cos(x) - 3 = 0, x \in (0, 2)$

   (b) $x^2 + \sin(x) + e^x - 2 = 0, x \in (0, 1)$

   using the methods of bisection and Newton-Raphson. Compare the methods by computing the number of iterations needed to achieve accuracy of 10^{-10}.

2. Find the root to the following equation, using the x=g(x) method (carefully select the x=g(x) format that converges):

   $$2e^x - 3x^2 = 0, x \in [-1, 1]$$

   Also use Newton-Raphson and compare the results of the two methods.

3. Find the Lagrange polynomials that have the same values as the given functions, at the points specified:

   $y(x) = 1 + \sin(\pi x)$, for x = -1, 0 and 1.

   $f(x) = 2x^{1/2}$, for x = 0,1 and 4.

4. Use Newton 's divided differences formula to calculate an interpolating polynomial going through the following points

x	f(x)
0.2	0.185
0.3	0.106
0.4	0.093
0.5	0.24
0.6	0.579
0.7	0.561