Question I:

A) Use the Bisection Method to find solution accurate to within 10^{-3} for

$$x + 3\cos(x) - e^{x} = 0 \ on\ the\ interval\ \ [0,1]$$

B)Use the Newton's Method to find solution accurate to within 10^{-3} for

$$(x-2)^2 - \ln(x) = 0 \; for \; e \le x \le 4$$

Question II:

$$let\ f(x) = \sqrt[3]{x-1}$$

and $x_0=1$; $x_1=1.25$; $x_2=1.6$

(a) Construct interpolation polynomials of degree at most one and at most two to approximate *f (1.4)* and find the absolute error.

(b) Find an error bound for this approximation

Question III:

(a) Use the composite Trapezoidal rule with n = 6 to approximate:

$$\int_0^2 \frac{2}{4+x^2}\, dx$$

(b) Approximate $\int_0^2 \frac{2}{4+x^2}\, dx$ using Composite Simpson's rule and find a bound for the error.

Question IV: $For\ A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & -2 & -1 \\ 1 & -1 & 1 \end{bmatrix}$

(a) Find P, L and U that satisfies PA = LU where P is a permutation matrix, L and U are lower and upper triangular matrices, respectively.

(b)Can you Factorize A as A = L D L^T where D and L are diagonal and lower triangular matrices, respectively? Justify your answer.

<u>**Question**</u> **V:** $For\ the\ system$:

$$Ax = b$$

$$with\ \ A = \begin{bmatrix} -2 & 1 & 1/2 \\ 1 & -2 & -1/2 \\ 0 & 1 & 2 \end{bmatrix}\ and\ b = \ \begin{bmatrix} 4 \\ -4 \\ 0 \end{bmatrix}$$

(a) Find the first two iterations of the Jacobi method using $X^{(0)}$= 0

(b) Find the first two iterations of the Gauss-Seidel method using $X^{(0)} = 0$

<u>Question</u> VI: For

$$A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 3 & 0 \\ 1 & 0 & 4 \end{bmatrix}$$

Determine if the matrix A is symmetric, singular, strictly diagonally dominant, positive definite. (justify your answer)

Good Luck ☺