**Lab Assignment**

CSTE-2106: Numerical Analysis

|  |  |
| --- | --- |
| 1. | Write a program to compute the value of from the following approximations.  i). Maclaurin expansion truncated after the second term  ii). Maclaurin expansion truncated after the fourth term |
|  |  |
| 2. | Write a program to find a real root of a nonlinear equation using Bisection method, False position method, Newton-Raphson method. |
| 3. | The matrix **A** is said to be of size **.** Where **m** represents number of columns and **n** represents number of rows. If , the matrix is said to be a square matrix of order **n.**  Write a program to perform the following matrix operations   1. Enter some numbers and represent these numbers as a matrix form according to given number of columns and rows.   **Sampl input:**  m=3, n=3  2 5 6 5 8 7 6 7 4  **Sample output:**   1. 5 6   5 8 7  6 7 4   1. Represent the above matrix **A** as an upper-triangular.   **Sample output:**  2 5 6  0 8 7  0 0 4   1. Represent the above matrix **A** as a lower-triangular matrix.   **Sample output:**  2 0 0  5 8 0  6 7 4   1. Represent the above matrix **A** as a diagonal matrix.   **Sample output:**  2 0 0  0 8 0  0 0 4 |
| 4. | Write a program to find (i) the determinant of a square matrix **A** and also find  (ii) the transpose, adjoint and inverse matrix of a square matrix **A**.  **Sample input:**  m=n=3  Matrix **A**:  3 1 2  2 -3 -1  1 2 1  **Sample output:**  The determinant of **A:**  8  The transpose of **A:**  3 2 1  1 -3 2  2 -1 1  The adjoint of **A:**  -1 3 5  -3 1 7  7 -5 -11  The inverse of **A:**  -0.1250 0.3750 0.6250  -0.3750 0.1250 0.8750  0.8750 -0.6250 -1.3750 |
|  |  |
| 5. | Write a program to solve a system of linear equations using simple Gaussian elimination method.  For example:    **Input:**  Use the following variables:  n – Number of equations in the system  a – Matrix of coefficients  b – Right side vector  **Output:**  x – Solution vector  **Sample Input:**  What is the size of the system (n)?  3  Input coefficients a(i , j), row-wise:  2 1 1  3 2 3  1 4 9  Input vector b:  10  18  16  **Sample Output:**  Solution vector x:  7.0000 -9.0000 5.0000 |
|  |  |
| 6. | Write a program to solve a system of linear equations using Matrix Inversion method.  For example:    **Input:**  Use the following variables:  n – Number of equations in the system  a – Matrix of coefficients  b – Right side vector  **Output:**  x – Solution vector  **Sample Input:**  What is the size of the system (n)?  3  Input coefficients a(i , j), row-wise:  3 1 2  2 -3 -1  1 2 1  Input vector b:  3  -3  4  **Sample Output:**  Solution vector x:  1.0000  2.0000  -1.0000 |
|  |  |
| 7. | Write a program to integrate a tabulated function using the trapezoidal rule.  **For example:**  Find, from the following table, the area bounded by the curve and the x-axis from x=7.47 to x=7.52 with h=0.01 |
|  | x f(x)  7.47 1.93  7.48 1.95  7.49 1.98  7.50 2.01  7.51 2.03  7.52 2.06  **Sample input:**  Input number of data points  6  Input table values, set by set  7.47 1.93  7.48 1.95  7.49 1.98  7.50 2.01  7.51 2.03  7.52 2.06  Initial value of x  7.47  Final value of x  7.52  What is the segment width?  0.01  **Sample output:**  Integral from 7.4700 to 7.5200 is 0.099650 |
|  |  |
| 8. | Write a program to integrate a tabulated function using the Simpson’s 1/3 rule.  **For example:**  Calculate the value of the integral by Simpson’s 1/3 rule with h=0.2  The values of for each point of sub-division are given below.   |  |  | | --- | --- | |  |  | | 4.0 | 1.3863 | | 4.2 | 1.4351 | | 4.4 | 1.4816 | | 4.6 | 1.5260 | | 4.8 | 1.5686 | | 5.0 | 1.6094 | | 5.2 | 1.6486 | |  |  |   **Sample input:**  Input number of data points  7  Input table values, set by set   |  |  | | --- | --- | | 4.0 | 1.3863 | | 4.2 | 1.4351 | | 4.4 | 1.4816 | | 4.6 | 1.5260 | | 4.8 | 1.5686 | | 5.0 | 1.6094 | | 5.2 | 1.6486 |   Initial value of x  4.0  Final value of x  5.2  What is the segment width?  0.2  **Sample output:**  Integral from 4.0000 to 5.2000 is 1.8278420 |
|  |  |
|  |  |
|  |  |
|  |  |