MAT 116E Advanced Scientific and Engineering Computing

Lab-9

Q-1. Write a user defined function that determines $\cos(x)$ using Taylor's series expansion. For function name and arguments, use ***y=cosTay(x),*** where the input argument x is the angle in radian and the output argument y is the value for $\cos(x)$. Inside the user-defined function, use a loop for adding the terms of the Taylor's series. If a_n is the n-term in the series, then the sum $S_n = S_{n-1} + a_n$. In each pass, calculate the estimated error E given by $E = \left|\frac{S_n - S_{n-1}}{S_{n-1}}\right|$. Stop adding terms when $E \leq 0.000001$.

Taylor Series expansion of $\cos(x)$ about $\mathrm{x} = 0$ is given as

$$\cos(\mathrm{x}) = 1 - \frac{\mathrm{x}^2}{2!} + \frac{\mathrm{x}^4}{4!} - \frac{\mathrm{x}^6}{6!} + \cdots = \sum_{\mathrm{n}=0}^{\infty} \frac{(-1)^{\mathrm{n}}}{(2\mathrm{n})!} \mathrm{x}^{2\mathrm{n}}$$

Q-2. In Linear Algebra, there are three cases for the solution of linear equation systems. That is, A linear equation system has no solution, exactly one solution or infinitely many solutions. Consider a linear equation system as

$$A \cdot x = B$$

where A is the coefficient matrix, x is the matrix of the unknown variables and B is the right hand side constants of the linear equation system. Let $A|B$ be the augmented matrix. When rank of A is less than rank of $A|B$, then it has no solution. Otherwise, when they are equal to each other, If the number of unknown variables is greater than rank of A or $A|B$, then it has infinitely many solutions. If the number of unknown variables equals rank of A or $A|B$, then it has exactly one solution.

Write a MATLAB function named **LinSysSolType** that takes input arguments A and B and evaluates type of solution of linear equation system.