# CLL:113-Tut-1(7.10.20)

## *Truncation Error:*

1. Determine the number of terms necessary to approximate cos x to 8 significant figures using the Maclaurin series approximation:

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!}$$

Calculate the approximation using a value of x = 0.3π. Write a program to determine your result.

## *Round-off Error:*

2.The infinite series

$$f(n) = \sum_{i=1}^{n} \frac{1}{i^4}$$

converges on a value of f (n) = $\pi^4/90$ as n approaches infinity. Write a program in single precision to calculate f (n) for n = 10,000 by computing the sum from i = 1 to 10,000. Then repeat the calculation but in reverse order—that is, from i = 10,000 to 1 using increments of −1. In each case, compute the true percent relative error. Explain the results.

## *Total Error in Iterative Methods*

The "divide and average" method, an old-time method for approximating the square root of any positive number a, can be formulated as

$$x = \frac{x + \frac{a}{x}}{2}$$

Write a computer program to evaluate the true percent relative error and the approximate percent relative error as a function of iteration steps, for a=5 and $x^0$ =0.005 if $\varepsilon_{tol}=10^{-6}$ .