

Assignment-1

(Due Date: 05 March 2013, Tuesday. Submit hard-copy, at class)

1. Identify for which values of x there is subtraction of nearly equal numbers, and find an alternate form that avoid the problem

(a) $\frac{1 - \sec x}{\tan^2 x}$

(b) $\frac{1 - (1 - x)^3}{x}$

(c) $\frac{1}{1 + x} - \frac{1}{1 - x}$

2. Use 5-digit arithmetic with **chopping** to determine the roots of the following equation

$$x^2 - 5000.002x + 10 = 0.$$

Compute percent relative errors for your results.

3. The Stefan-Boltzmann law can be employed to estimate the rate of radiation of energy H from a surface as in

$$H = Ae\sigma T^4$$

where H is in Watts, A = the surface area (m^2), e = the emissivity that characterizes the emitting properties of the surface (dimensionless), σ = a universal constant called the Stefan-Boltzmann constant ($= 5.67 \times 10^{-8} \text{ Wm}^{-2} \text{ K}^{-4}$), and T = absolute temperature (K).

Determine the error of H for a copper sphere with radius $r = 0.15 \pm 0.01$ m, $e = 0.9 \pm 0.05$, and $T = 550 \pm 20$.

4. Calculate the random access memory (RAM) in megabytes necessary to store a three-dimensional array of $20 \times 40 \times 120$ size. To store the elements of this array *double precision* format is used. So each element requires a 64-bit word.

Recall that a 64-bit word = 8 bytes, and 1 kilobyte = 2^{10} bytes.