Assessment #1

Math 370 — Numerical Analysis

Assigned: Fri Jan 17 — **Due: Fri Jan 24**

Do the following homework questions found in the text book (*Numerical Analysis*, Burden & Faires (5th Edition), 1993). Odd-numbered problems have solutions in the back

The main part of the homework involves doing Section 1.1, Page 21: #2, #4, #13(b),(c) and #14(b),(c)

1 Suppose p^* must approximate p with relative error at most 10^-3. Find the interval in which p^* must lie if p is

a. 150 **b.** 900 **c.**1500 **d.** 90

2 Perform the following computations

(i) exactly

(ii) using three-digit chopping arithmetic

(iii) using three-digit rounding arithmetic

(iv) Compute the relative errors in parts *(ii)* and *(iii)*

a. $\frac{4}{5}+\frac{1}{3}$ **b.** $\frac{4}{5}\cdot\frac{1}{3}$

c. $\left(\frac{1}{3}+\frac{3}{11}\right)+\frac{3}{20}$ **d.** $\left(\frac{1}{3}-\frac{3}{11}\right)+\frac{3}{20}$

3 Using the IBM mainframe format that we discussed in class, find the decimal equivalent of the following floating-point machine numbers:

a. $\boxed{1 \mid 1000011 \mid 101010010011000000000000}$ **b.** $\boxed{0 \mid 0111111 \mid 010001111000000000000000}$

4 **a.** For both of the numbers in the previous problem, write down the computer memory representation of the next biggest and next smallest machine number.

b. Write down the decimal equivalent for **one** of your answers to part (a)

5 In a vain attempt to prevent Microsoft© from taking over the world, Machines de Buckmire International (MBI) is coming out with the EDSEL, which uses brand-new 8-bit technology to represent floating-point numbers. It uses a 1-bit sign indicator, a 3-bit characteristic and a 4-bit mantissa. Here is the definition:

$$fl(x) = (-1)^s \times 2^{c-4} \times q$$

where the normalization is the first digit of the mantissa must be a 1.

a. What is the largest normalized positive number BMI's Edsel can hold in memory?

b. What is the smallest normalized positive number BMI's Edsel can hold in memory?

b. Write down the generic decimal machine number representation of numbers the Edsel can hold (e.g. $d_1 d_2 d_3 \ldots d_k \times 10^n$)

Journal

Write down a paragraph on any subject related to the class that you want to. Some sample topics for commentary are my teaching style, the class handouts, the textbook, class size, the syllabus or whatever you want me to know about your previous math experience.

Online Participation

Send electronic mail to `370@abacus.oxy.edu` with your thoughts on the following question:
"Which is a better solution to the problem of representing floating point numbers using a finite mount of digits: **chopping** or **rounding**?"