

Quiz 1

Numerical Analysis

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Wednesday September 8

Time Begun: \_\_\_\_\_

Ron Buckmire

Time Ended: \_\_\_\_\_

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**Topic :** Machine Representation of Numbers

The idea behind this quiz is for you to indicate your understanding of how computers represent numbers in memory, and the effects of these representations on numerical calculations.

**Instructions:**

1. Once you open the quiz, you have as much time as you need to complete it, but record your start time and end time at the top of this sheet.
2. You may use the book or any of your class notes. You must work alone.
3. If you use your own paper, please staple it to the quiz before coming to class. If you don't have a stapler, buy one.
4. After completing the quiz, sign the pledge below stating on your honor that you have adhered to these rules.
5. Your solutions must have enough details such that an impartial observer can read your work and determine HOW you came up with your solution.
6. Relax and enjoy...
7. **This quiz is due on Friday September 10**, in class. NO LATE QUIZZES WILL BE ACCEPTED.

**Pledge:** I, \_\_\_\_\_, pledge my honor as a human being and Occidental student, that I have followed all the rules above to the letter and in spirit.

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1. In a vain attempt to prevent Microsoft<sup>©</sup> from taking over the world, Machines de Buckmire International (MBI) is coming out with the Elppa, which uses brand-new 8-bit technology to represent floating-point numbers. It uses a 1-bit sign indicator, a 2-bit characteristic and a 5-bit mantissa. Here is the definition:

$$fl(x) = (-1)^s \times 16^{c-2} \times q$$

where the normalization is the the mantissa must be **non-zero**.

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

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

c. The following bit of memory in the Elppa represents the number **-12.5**.

1	11	11001
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Find the **next largest** and **next smallest** numbers that the Elppa can represent in memory. (Show the memory representation and then compute the values.)

d. What would the output be if you tried to multiply -2 by 8 on a MBI Elppa computer?