AMSC/CMSC 660 Quiz 1 , Fall 2004

Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. Use no books, calculators, cellphones, other electronic devices, communication with others, scratchpaper, etc.

Name _____

Student number _____

For Question 1, assume you have a base 2 computer that stores floating point numbers using a 6 digit normalized mantissa (x.xxxxx), a 4 digit exponent, and a sign for each. Assume that all numbers are chopped rather than rounded.

1a. (5) For this machine, what is machine epsilon, the smallest nonzero positive number which, added to 1, gives a number different from 1?

1b. (5) What mantissa and exponent are stored for the value 1/10? Hint:

$$\frac{1}{10} = \frac{1}{16} + \frac{1}{32} + \frac{1}{256} + \frac{1}{512} + \frac{1}{4096} + \frac{1}{8192} + ...?$$

2. (5) Suppose that you have measured the length of the side of a cube as $(3.00 \pm .005)$ meters. Give an estimate of the volume of the cube and a (good) bound on the absolute error in your estimate.

3. (5) Consider the following Matlab code:

```
x = .1;
sum = 0;
for i=1:100
  sum = sum + x;
end
```

Is the final value of `sum` equal to 10? If not, why not?