

AMSC/CMSC 660 Quiz 1 , Fall 2003

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, communication with others, scratchpaper, etc.

Name \_\_\_\_\_

Student number \_\_\_\_\_

For this page of the quiz, assume you have a base 10 computer that stores floating point numbers using a 5 digit normalized mantissa ( $x.xxxx$ ), 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 is the smallest positive number that can be represented exactly in this machine?

2. Suppose I have measured the sides of a rectangle as  $3.2 \pm .005$  and  $4.5 \pm .005$ , and I compute an approximation to the area as  $A = 14$ .
- (5) Give a forward error bound for the computation.

- (5) Give a backward error bound.