MATH 335: Numerical Analysis

Problem Set 2, Final version

Due Date: Mon., Feb. 9, 2009

Read: Section 2.1 in Kharab & Guenther.

Problems:

1. Do **Computer Problem** 1, pp. 23–24 in K & G.
2. Convert to decimal numbers:
   (a) $(11011.01)_2$
   (b) $(201.112)_3$
   (c) $(56C.F)_{16}$ (Note: In hexadecimal—base 16—representations, we have the digits 0, 1, 2, . . . , 9, A, B, . . . , F.)
3. Convert to binary:
   (a) $(38.90625)_{10}$
   (b) $(56C.F)_{16}$ (Hint: This is easier to do directly than to use your answer from part (c) above.)
4. Convert the following IEEE 32-bit floating point representations to decimal numbers:
   (a) 1 11010011 00101110111100101000000
   (b) 0 00011111 10011010000000000000000
5. In decimal notation, the number $1/10 = (0.1)_{10}$ is written very succinctly.
   (a) Find the binary representation of 1/10.
   (b) Give the IEEE 32-bit floating point representation of 1/10. Keep in mind that after the first occurrence of a '1' in your answer to part (a), the next 23 bits are kept. Also, round on the first bit not kept. Assume this is done analogously to decimal representations (in fact, this is generally *not* the case), where we round up if the first discarded decimal digit is 5–9 but round down if it is 0–4; so round up if the first discarded bit is a 1.
   (c) Now take your answer in part (b) and convert it back to a decimal number, accurate at least to 13 decimal places. Is 1/10 a machine number on a binary computer?