

Math 571 – Fall 2007 – Homework #1
Due Thursday, Aug 30

You can use any written resources, but please work alone.

1. If $\beta = 2$ (base) and $t = 24$ (digits in mantissa) and $-127 \leq e \leq 128$ on a computer, how many different normalized floating point numbers can be represented (form $f = \pm m \times \beta^e$)?
2. Given 3 numbers a , b and c , they can be added together in 3 different orders. Construct an example with 3 specific numbers so that in floating point arithmetic with $\beta = 10$ and $t = 2$, these three different orders produce at least 2 different answers.

Is it possible to construct an example where there are 3 different answers?

3. (#1.1 pg. 9) Let B be a 4×4 matrix to which we apply the following operations (in this order):
 - (a) double column 1
 - (b) halve row 3
 - (c) add row 3 to row 1
 - (d) interchange columns 1 and 4
 - (e) subtract row 2 from each of the other rows
 - (f) replace column 4 by column 3
 - (g) delete column 1

Write the result as a product of 8 matrices

Write the result as a product ABC (same B).

4. (#2.6 pg. 16) If u and v are m -vectors, the matrix $A = I + uv^*$ is known as a *rank-one perturbation of the identity*. Show that if A is nonsingular, then its inverse has the form $A^{-1} = I + \alpha uv^*$ for some scalar α , and give an expression for α . For what u and v is A singular? If it is singular, what is $\text{null}(A)$?