

Quiz 01

Sep 29, 2020.

1. How many bits does it take to store a binary floating point number of the form $\pm 1.a_1a_2\cdots a_t \times 2^e$ with $t = 10$, $a_j \in \{0, 1\}$, $-14 \leq e \leq 15$? What is the distance from 1.0 to nearest floating number? Explain.
2. Suppose that if $fl(y)$ is a k -digit rounding approximation to y . Show that

$$\left| \frac{y - fl(y)}{y} \right| \leq 5 \times 10^{-k}$$

Remark: A k -digit rounding means, given $y = \pm 0.d_1d_2\cdots d_kd_{k+1}\cdots \times 10^n$, $0 \leq d_i \leq 9$, then $fl(y)$ obtained by changing d_k to $\tilde{d}_k$ according to the value of d_{k+1} .

3. We showed in class the estimate of relative error resulted from $x \times y$ in terms of ε_M . Derive the corresponding result for x/y , $y \neq 0$.
4. Solve for $x^2 - 2100x + 1 = 0$ to 15 correct digits using standard double precision arithmetic. Explain how you find your answer (No explanation, no points).
5. Let $A = \{(x - 100)^2 + y^2 < (40\pi)^2\}$, and $B = \{x + y > 50.1\}$. Find the number of grid points (i, j) (i, j are integers) in $A \cap B$. Write down the answer and name your code by your student ID number.

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