

Worksheet #3 (2017/09/20)

Name:

ID:

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- We plan to cover Sections 1.3.8–1.5 today.
 - We use Chapter 01 slides 36–46.
 - This is corresponding to the textbook pages 23–39.
- 1) Last time, we discuss the machine epsilon, e.g., the popular IEEE DP has a small machine epsilon of $\epsilon_{\text{mach}} = 2^{-53} \approx 10^{-16}$. What does this mean? What can we do if we need even smaller machine epsilon?
 - 2) Show that in binary, the mantissa of $1/10$ has more than p digits.
 - 3) Use standard model to analysis the rounding error of $x(y+z)$. We start from: $fl(y+z) = (y+z)(1+\delta_1)$, where $|\delta_1| \leq \epsilon_{\text{mach}}$. We then have $fl(x(y+z)) = (x((y+z)(1+\delta_1)))(1+\delta_2)$, where $|\delta_2| \leq \epsilon_{\text{mach}}$. Give a bound on the total forward error δ .
 - 4) On slide 46, explain why the single cancellation at end of one-pass formula is more damaging numerically than all cancellations in two-pass formula combined?