# Basics of Information Systems

Winter Semester 2022–23

For discussion on Wednesday, November 16, 2022

1. Convert the following single-precision floating point number to decimal:

   $$1\,10001010\,11000010000000000000000$$

2. Show that floating point division has moderate growth of relative error for all numbers.

3. Does the associative law hold for floating point computations?

4. Identify values of $x$ for which there is a substantial growth of relative error (due to subtraction of almost equal numbers), and suggest an alternate formula that improves accuracy for the problematic range of $x$.

   (a) $\dfrac{1-(1-x)^3}{x}$

   (b) $\dfrac{1-\sqrt{1-x^2}}{x}$

   (c) $\dfrac{1-\sec x}{\tan^2 x}$

   *Hint:* Recall that $\sec x = (\cos x)^{-1}$; use the well-known trigonometric identity $\sec^2 x = \tan^2 x + 1$.