

CS370 Lecture 1

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Five Topics in the Course

- Floating point numbers and Arithmetic
- Iterpolation, Splines, Parametric Curves
- Initial Value Problems - solve differencial equations
- Discrete Fourier Analysis
- Numerical Linear Algebra - solve equations - google pagerank

Topic 1 Floating Point Arithmetic

Examples where problems come whehn using approximation

eg1. $e^{-5.5} =$

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots + \frac{x^n}{n!} + \dots$$
$$e^{-x} = \frac{1}{e^x}$$
$$e^{-5.5} = \frac{1}{e^{5.5}} = \frac{1}{1 + 5.5 + \frac{5.5^2}{2} + \dots}$$

Now do arithmetic keeping only 5 digits. In both cases infinite sums remain unchanged after 25 terms. There is no sense in going any further - we end up just truncating all of the terms after this as they are smaller than the 5th digit.

Method 1 gives $e^{-5.5} = 0.0026363$

Method 2 gives $e^{-5.5} = 0.0040868$

eg2. $ax^2 + bx + c = 0$

$$x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$
$$x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$