QUIZ 1

1. **What are the advantages and disadvantages of numerical analysis?**

   - possible to solve problems that may not be solvable by hand
   - possible to solve problems (that you may have solved before) in a different way
   - only need four operations (add, substract, multiply, division) and Comparasion
   - analytical answer is not the true (exact) answer that it is always an approximation
   - accuracy and precision concepts are important

2. **Describe truncation and round-off errors. Give example.**

   - **Truncation Error**: i.e., approximate e^x by the cubic power

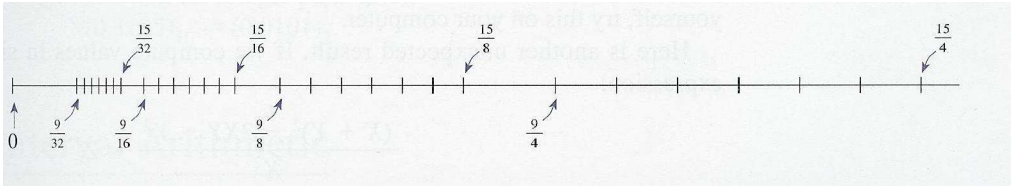
     $$P_3(x) = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!}; \qquad e^x = P_3(x) + \sum_{n=4}^{\infty} \frac{x^n}{n!}$$

     approximating e^x with the cubic gives an inexact answer. The error is due to truncating the series.
   - **Round-off Error**: All computing devices represents numbers, except for integers and some fractions, with some imprecision
     Floating-point numbers of fixed word length; the true values are usually not expressed exactly by such representations

3. **Describe a hypothetical numbering system with six bit representation?**

   - Say we have six bit representation (not single, double)
     - 1 $bit \rightarrow sign$
     - 3(+1) $bits \rightarrow mantissa$
     - 2 $bits \rightarrow exponent$

     For positive range $\frac{9}{32} \longleftrightarrow \frac{15}{4}$
     For negative range $\frac{-15}{4} \longleftrightarrow \frac{-9}{32}$; even discontinuity at point zero since it is not in the ranges.
     Very simple computer arithmetic system $\Rightarrow$ the gaps between stored values are very apparent. Many values can not be stored exactly.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