

Chapter 1 Mathematical Preliminaries

The Effect of Round-Off Error

Example 1 :

$$\lim_{x \rightarrow 0} \frac{1 + x - 1}{x}$$

Theoretically $\lim_{x \rightarrow 0} \frac{1 + x - 1}{x} = 1$, but numerically not so due to round-off error.

Example 2 :

$$p_n = \frac{10}{3} p_{n-1} - p_{n-2},$$

The solution is

$$p_n = C_1 \left(\frac{1}{3}\right)^n + C_2 3^n$$

Given $p_0 = 1$ and $p_1 = \frac{1}{3}$, then $C_1 = 1$ and $C_2 = 0$, and the answer

is $p_n = \left(\frac{1}{3}\right)^n$, but numerically not so due to round-off error.

References:

- 【1】 R. L. Burden and J. D. Faires, *Numerical Analysis*, PWS, Boston, 1993.