Numerical Analysis

Lusine Poghosyan

AUA

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Example

Suppose $x = \frac{5}{7}$, $u = 0.714251$ and $v = 98765.9$. Use five-digit chopping to calculate $(x - u) \times v$.

$$x = \frac{5}{7} = 0.\overline{714285}$$

Operation	Result	Actual Value	Abs. Error	Rel. Error
$x \ominus u$	0.30000×10^{-4}	0.34714×10^{-4}	0.471×10^{-5}	0.136
$(x \ominus u) \otimes v$	0.29629×10^{1}	0.34285×10^{1}	0.465	0.136

Example

Calculate $b = \sqrt{2.01} - \sqrt{2}$ using three-digit chopping.

$$\sqrt{2.01} = 1.417744...$$

$$\sqrt{2} = 1.4142135...$$

Example (MATLAB)

Plot the graph of $P(x) = (x-1)^6$ on the interval $[0.995, 1.005]$.

Example (MATLAB)

Plot the graph of $P(x) = x^6 - 6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x + 1$ on the interval $[0.995, 1.005]$.

- Suppose a_1^* and a_2^* are approximations of a_1 and a_2. Show that

$$abserr(a_1 + a_2, a_1^* + a_2^*) \leq abserr(a_1, a_1^*) + abserr(a_2, a_2^*).$$

- Suppose a_1^* and a_2^* are approximations of $a_1 > 0$ and $a_2 > 0$. Show that

$$relerr(a_1 + a_2, a_1^* + a_2^*) \leq \max_{i=1,2} relerr(a_i, a_i^*).$$

- Assume that we know the approximate value a^* of $a \in [2, 5]$ and that $abserr(a, a^*) < 2$. Estimate $abserr(\frac{1}{a}, \frac{1}{a^*})$ in terms of $abserr(a, a^*)$ only.