

TD1 : Error Analysis

Exercise 1:

Round the following numbers to 4 significant digits and calculate the absolute and relative rounding errors:

1. 12.3456712
2. 0.005678912
3. 123456.789

Exercise 2:

A cylindrical object has a radius of $r = 4.50\text{cm} \pm 0.02\text{cm}$ and a height of $h = 12.10\text{ cm} \pm 0.05\text{ cm}$

1. Calculate the volume $V = \pi r^2 h$ the cylinder.
2. Determine the propagated error in the volume.

Exercise 3:

Consider the approximation of the exponential function e^x using the first three terms of its Taylor series expansion:

$$e^x \approx 1 + x + \frac{x^2}{2}$$

For $x = 0.5$, calculate:

1. The approximate value of e^x using the truncated series.
2. The truncation error compared to the exact value of e^x .

Exercise 4:

Perform the following calculations and report each answer with the correct number of significant figures.

- a) 62.8×34 ; b) $0.147 + 0.0066 + 0.012$; c) $38 \times 95 \times 1.792$; d) $\frac{88.5 - 87.57}{45.1}$

Exercise 5:

Given

- value: $x = 0.1256$
- Relative error: 0.5%

- 1) Calculate the Absolute Error.
- 2) Determine the Number of Correct Significant Figures.
- 3) Round x to the Last Exact Significant Figure.