CN A – Notebook

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Conteúdo

1 Definitions

Defining errors

Let Q and $\tilde{Q}$ be the true and approximate values of a physical quantity.

$$\varepsilon_Q = \Delta Q = Q - \tilde{Q} \qquad \text{(Error)}$$

$$|\varepsilon_Q| = |\Delta Q| = |Q - \tilde{Q}| \qquad \text{(Absolute Error)}$$

$$\mathrm{r}_Q = \left|\frac{\Delta Q}{Q}\right| = \left|1 - \frac{\tilde{Q}}{Q}\right| \qquad \text{(Relative Error)}$$

$$\varepsilon_Q \begin{cases} < 0 & \text{Approximating by green]excess} \\ > 0 & \text{Approximating by red]defect} \end{cases}$$

Categorizing errors

There are two kinds of errors:

Random/Precision errors   are caused by unpredictable changes in the environment, can be easily detected and analyzed by statistical methods.

Systematic errors   are the result of how an experiment is conducted and can be identified by leading to results that are too high or too low.

1.1 Intervalo que contem x

$$I_x = [\hat{x} - \eta_x, \hat{x} + \eta_x] : |x - \hat{x}| \leq \eta_x$$

$$\eta_x \begin{cases} 0.5 * 10^{-i} & : \hat{x} * 10^i \in \mathbb{Z} \\ \eta_x & : \hat{x} \pm \eta_x \\ y * 10^{-i} & : \hat{x}\,(y) \wedge \hat{x} * 10^i \in \mathbb{Z} \end{cases}$$

12.3

Resposta

$|x - \hat{x}| \leq 0.5 * 10^{-1} = \eta_x$
$\therefore I_x = [12.3 - 0.05, 12.3 + 0.05] =$
$= [12.25, 12.35]$

Resposta

$|x - \hat{x}| \leq 0.07 = \eta_x$
$\therefore I_x = |87.9 - 0.07, 87.9 + 0.07| =$
$= |87.83, 87.97|$

400.32 (6)

Resposta

$|x - \hat{x}| \leq 6 * 10^{-2} = \eta_x$
$\therefore I_x = [400.26, 400.38]$

87.9 ± 0.07

$x = 1/17 \qquad \hat{x} = 0.059$

Resposta

(i)   Erro Absoluto

$|\varepsilon_x| = |x - \hat{x}| = |1/17 - 0.059| = 0.17647\ldots\,\text{E}^-3 \leq 0.177\,\text{E}^-3$

(ii)   Erro relativo

$r_x = \dfrac{|x - \hat{x}|}{|x|} = \dfrac{|1/17 - 0.059|}{|1/17|} = 0.300\,\text{E}^-2$