Luishiño Pericena Choque

PRACTICO #1

1: Determinar la serie de Maclaurin para $f(x) = sen(x)$ con x en radianes

$f(x) = Sen\,x \qquad f(0) = Sen\,0 = 0$
$f'(x) = Cos\,x \qquad f'(0) = Cos\,0 = 1$
$f''(x) = -Sen\,x \qquad f''(0) = -Sen\,0 = 0$
$f'''(x) = -Cos\,x \qquad f'''(0) = -Cos\,0 = -1$
$f^{IV}(x) = Sen\,x \qquad f^{IV}(0) = Sen\,0 = 0$

$$f(x) = f(0) + f'(0)x + \frac{f''(0)}{2!}x^2 + \frac{f'''(0)}{3!}x^3 + \frac{f^{IV}(0)}{4!}x^4 + \cdots$$

$$= \sum_{n=0}^{\infty} \frac{f^{(n)}(0)}{n!}x$$

$$Sen\,x = x - \frac{1}{3!}x^3 + \frac{1}{5!}x^5 - \frac{1}{7!}x^7 + \frac{1}{9!}x^9$$

2 Utilizando el resultado del item anterior calcular Sen (1), introducir un termino a la vez y calcular los errores relativos verdadero y aproximado. Tomar como valor verdadero:
Sen (1) = 0.841470984 8 introducir terminos de la serie del item anterior hasta que $|\varepsilon_a| < \varepsilon_s$ considerando 4 cifras Significativas

Sen (1) = 0,8414709848

$|\varepsilon_a| < \varepsilon_s$ Considerando 4 cifras
valor verdadero
Sen (1) = 0,8414709848
$\varepsilon_s = 0.5 \times 10^{2-n} = 0,5 \times 10^{2-4} = 0,5 \times 10^{-2} = 0,005\%$

Sol.
1^{ra} aproximación
$Sen\,X \cong x \; : \; Sen\,(1) \cong 1$

$$EV(\%) = \frac{V_{ved} - V_{apro}}{V_{ved}} * 100\%$$

$$EV(\%) = \left| \frac{0,8414709848 - 1}{0,8414709848} \right| * 100\% = 18,84\%$$

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2do Aproximación

$$\text{Sen } x = x - \frac{1}{3!}x^3 \therefore \text{Sen}(1) = 1 - \frac{1}{3!}\cdot 1^3 = 0{,}8333333333$$

$$EV(\%) = \left| \frac{0{,}8414709848 - 8{,}333}{0{,}8414709848} \right| * 100\% = 9{,}671$$

$$\varepsilon_a(\%) = \frac{8{,}333 - 1}{8{,}333} * 100\% = 20\%$$

3ra Aproximación

$$\text{Sen } x = x - \frac{1}{3!}x^3 + \frac{1}{5!}x^5$$

$$\text{Sen}(1) = 1 - \frac{1}{3!}\cdot 1^3 + \frac{1}{5!}\cdot 1^5 = 0{,}8416666667$$

$$EV(\%) = \left| \frac{0{,}8414709848 - 0{,}8417}{0{,}8414709848} \right| * 100\% = 2{,}325 \times 10^{-2}$$

$$\varepsilon_a(\%) = \left| \frac{0{,}8417 - 0{,}8333}{0{,}8417} \right| * 100 = 0{,}999$$

4ta Aproximación

$$\text{Sen } x = x - \frac{1}{3!}x^3 + \frac{1}{5!}x^5 - \frac{1}{7!}x^7 =$$

$$\text{Sen } 1 = 1 = \frac{1^3}{3!} + \frac{1^5}{5!} - \frac{1^7}{7!} = 0{,}841468254$$

$$EV(\%) = \left| \frac{0{,}8414709848 - 0{,}841468284}{0{,}8414709848} \right| * 100$$

$$EV(\%) = 3{,}245 \times 10^{-4}$$

$$\varepsilon_a(\%) = \left| \frac{0{,}841468254 - 0{,}8416666667}{0{,}84146868254} \right| = 0{,}02388\%$$

5ta Aproximación

$$\text{Sen } x = x - \frac{1}{3!}x^3 + \frac{1}{5!}x^5 - \frac{1}{7!}x^7 + \frac{1}{9!}x^9$$

$$\text{Sen } 1 = 1 - \frac{1^3}{3!} + \frac{1^5}{5!} - \frac{1^7}{7!} + \frac{1^9}{9!} = 0{,}8414710097$$

$$EV(\%) = \left| \frac{0{,}84144709848 - 0{,}8414710097}{0{,}84114709848} \right| * 100$$

$$\varepsilon_a(\%) = 0{,}0000029\%$$

$$\varepsilon_a < 0{,}000002\%.$$

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3 Utilizar las reglas de Redondeo:

a) Redondear a 4 cifras significativas:

a.1) 70 105001 = 7011

a.2) $7{,}4055 = 7{,}406$

a.3) $2{,}1665002 = 2{,}167$

b) Sumas y Restas

b.1) $4{,}307 + 1{,}3 = 5{,}6$ //

$$\begin{array}{r} 4{,}307 \\ +\ 1{,}3 \\ \hline 5{,}607 \end{array}$$

b.2) $6{,}193 \times 10^{-5} - 2{,}21 \times 10^{-7} =$

$$\begin{array}{r} -\ 6{,}1930 \\ 0{,}022 \\ \hline 6{,}179 \end{array}$$

$6{,}193 \times 10^{-5} - 0{,}0221 \times 10^{-5}$

$= (6{,}193 - 0{,}0221) \times 10^{-5}$

$= 6{,}1779 \times 10^{-5}$

$= 6{,}18 \times 10^{-5}$ //

c) Multiplicar y División

c.1) $\dfrac{501}{7{,}7} = 65{,}06493506 = 65$

c.2) $\dfrac{[3{,}15 \times 10^{-3} (1{,}207 \times 10^{-5} + 6{,}88 \times 10^{-8})]}{(3{,}401 + 6{,}27 \times 10^{3})}$

(I) $1{,}27 \times 10^{-5} + 6{,}88 \times 10^{-8} = 1{,}207 \times 10^{-5} + 0{,}00688 \times 10^{-5}$

$= (1{,}207 + 0{,}00688) \times 10^{-5}$

$= 1{,}21388 \times 10^{-5}$

$= 1{,}214 \times 10^{-5}$ //

(II) $3{,}15 \times 10^{-3} * 1{,}214 \times 10^{-5} = 3{,}8241 \times 10^{-8}$

$= 3{,}82 \times 10^{-5}$ //

(III) $3{,}401 + 6{,}27 \times 10^{3} = 3{,}401 + 6270$

$= 6273{,}401$

$= 6273$ //

$\dfrac{3{,}82 \times 10^{-8}}{6273} = 6{,}089590303 \times 10^{-12}$

$= 6{,}09 \times 10^{-12}$