Lista 4

1) $h = (b-a) = 2 - 1 = 1$

$$\int_1^2 (x\,\mathrm{sen}(x) + x)\,dx \approx \frac{h}{2}[f(x_0) + f(x_1)] = \frac{1}{2}[1.8415 + 2.9093] \approx 2.3754$$

$$\int f''(x) = (x\,\mathrm{sen}(x) + x)\,dx = (\cos(x) + 1) = (1 + \mathrm{sen}(x))$$

$$\|\epsilon\| \leq \frac{h^3}{12} \cdot \max |f''(x)| \;\; x \in [a,b] \Rightarrow \|\epsilon\| \leq \frac{1^3}{12} \cdot |-\mathrm{sen}(2)| = \frac{1}{12} \cdot |-0.9093| \Rightarrow$$

$\rightarrow 0.0758$ resultado em radianos.

2) $h = \frac{b-a}{N} = \frac{2-1}{8} = 0.125$

X	1	1.125	1250	1.375	1500	1625	1750	1.875	2
$f(x_i)$	1.8415	2.0273	2.1990	2.3559	2.4975	2.6235	2.7340	2.8291	2.9093

$$\int_a^b f(x)dx = \frac{h}{2}[f_0 + 2f_1 + 2f_2 + \cdots + 2f_{n-1} + f_n]$$

$$\int_1^2 (\mathrm{sen}(x) + x)dx \approx \frac{0.125}{2}[1.8415 + 4.0546 + 4.3981 + 4.7119 + 4.995 + 5.247 + 5.4682 +$$

$$+ 5.6582 + 2.9093] \Rightarrow 2.45520125$$

$$\|E_1\| \leq \frac{h^2}{12}(b-a) \cdot \max |1^2(x)| = \frac{(0.125)^2}{15} \cdot (2-1) \cdot |-\mathrm{sen}(2)| \Rightarrow 0.0012$$

0.9071

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3)

$(b-a) = 2h \Rightarrow (2-1) = 2h \Rightarrow 1/2 = h \Rightarrow h = 0.5$

X	1	1.5	2
f(x)	1.8415	2.4975	2.9093

$$\int_1^2 (\operatorname{sen}(x) + x)\,dx \cong \frac{0.5}{3}\,[1.8415 + 9.99 + 2.9093] \cong \boxed{2.4568}$$

$f^{(4)}(x) \Rightarrow (\cos(x) + 1) \Rightarrow -\operatorname{sen}(x) \Rightarrow -\cos(x) \Rightarrow \operatorname{sen}(x)$

$$|E| \leq \frac{h^5}{90} |f^{(4)}(x)| \Rightarrow \frac{0.5^5}{90} |\operatorname{sen}(2)| \Rightarrow \frac{0.03125}{90} \cdot (0.9093) \cong \boxed{0.000^3}$$

4) $h = \frac{b-a}{N} = \frac{2-1}{8} = 0.125$

	0	1	2	3	4	5	6	7	8
X	1	1.125	1.250	1.375	1.500	1.625	1.750	1.875	2
f(x)	1.8415	2.0273	2.1990	2.3659	2.4975	2.6295	2.7340	2.8291	2.9093
		X4	X2	X4	X2	X4	X2	X4	

$$\int_1^2 (\operatorname{sen}(x) + x)\,dx = \frac{0.125}{3}\,[1.8415 + 8.1092 + 4.398 + 9.4236 + 4.995 + 10.494 + 5.468 + 11.3164 + 2.9093] \Rightarrow 2.4565//$$

$$|\epsilon| \leq \frac{h^4}{180} (b-a) \max |f^{(4)}(x)| \Rightarrow \frac{(0.125)^4}{180} \cdot (1)\ (\operatorname{sen}(2)) \Rightarrow 0.000001$$