Atividades Acompanhadas

2) a)

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$f(x) = e^{2x} - 2x^3 - 5$

$\xi = 0,001$

Saber quantas iterações

$a = -1$

b 1

$k \geq \log_2 \left(\dfrac{b-a}{\xi} \right) - 1$

$k \geq \log \left(\dfrac{1-(-1)}{0,001} \right) - 1$

$k \geq 9,9657842846 62087$

$k \geq 10$

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k	a_k	b_k	$f(a_k)$	$f(b_k)$	x_k	$f(x_k)$	$x_k - x_{k-1}$
0	−1	1	−2,86466471	0,38905609	0	−4	—
1	0	1	−4	0,38905609	0,5	−2,53171817715	0,5
2	0,5	1	−2,53171817715	0,38905609	0,75	−1,362060929	0,25
3	0,75	1	−1,362060929	0,38905609	0,875	−0,585241073s	0,125
4	0,875	1	−0,585241073s	0,38905609	0,9375	−0,127130098	0,0625
5	0,9375	1	−0,127130098	0,38905609	0,96875	0,123077748 13	0,03125
6	0,9375	0,96875	−0,127130098	0,12307748 13	0,953125	−0,0039154612	0,015625
7	0,953125	0,96875	−0,0039154612	0,12307748 13	0,9609375	0,059098699	0,0078125
8	0,953125	0,9609375	−0,0039154612	0,059098699	0,95703125	0,027472 3101	0,00390625
9	0,953125	0,95703125	−0,0039154612	0,0274723101	0,955078125	0,0117487544	0,001953125
10	0,953125	0,955078125	−0,0039154612	0,0117487544	0,954 1015625	0,0039090924863	0,0009765625

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c) $f(x) = x^2 + \ln x \rightarrow \xi \leq 0,001$ | Ver quantidade de Iterações

$a = 0,25$

$b = 1$

$k \geq \log_2\left(\frac{b-a}{\xi}\right) - 1 \Rightarrow k \geq \log_2\left(\frac{1-0,25}{0,001}\right) - 1 \Rightarrow k \geq 9$

$\boxed{k \geq 10}$

k	ak	bk	f(ak)	f(bk)	xk	f(xk)	(xk − xk−1)
0	0,25	1	-1,3237943611	1	0,625	-0,079378629	—
1	0,625	1	-0,079378629	1	0,8125	0,4525168852	0,1875
2	0,625	0,8125	-0,079378629	0,4525168852	0,71875	0,1863598756	0,09375
3	0,625	0,71875	-0,079378629	0,1863598756	0,671875	0,053733047	0,046875
4	0,625	0,671875	-0,079378629	0,053733047	0,6484375	-0,012718464	0,0234375
5	0,6484375	0,671875	-0,012718464	0,053733047	0,66015625	0,020527544$	0,01171875
6	0,6484375	0,66015625	-0,012718464	0,020527544$	0,65429687$	0,0039103074	0,005859375
7	0,6484375	0,654296875	-0,012718464	0,0039103074	0,651367187$	0,0044025467	0,0029296875
8	0,6484375	0,651367187$	-0,012718464	0,0044025467	0,64990234375	-0,0085601113	0,00146484375
9	0,64990234375	0,651367187$	-0,0085601113	0,0044025467	0,65063476562$	-0,0064812318	0,0007324218$

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3) b) $g(x) = 2x + x^2 \cdot \cos(x)$ $\varepsilon \cong 10^{-4}$ Usando $a = 0{,}01$ $b = -0{,}01$

$f(x_1) = -0{,}019900005$; $f(x_0) = 0{,}020099995$ $x_0 = a = 0{,}01$ $x_1 = b = -0{,}01$

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$k = 1$

$x_2 = x_1 - \dfrac{f(x_1) \cdot (x_1 - x_0)}{f(x_1) - f(x_0)}$ $\Rightarrow x_2 = -0{,}01 - \left(\dfrac{-0{,}019900005 \cdot (-0{,}02)}{-0{,}019900005 - 0{,}020099995} \right)$

$x_2 = -0{,}01 - \left(\dfrac{3{,}980001 \times 10^{-4}}{-0{,}04} \right)$ $\Rightarrow x_2 = -4{,}99975 \times 10^{-5}$

Pelo criterio de parada: $|x_2 - x_1| = |-4{,}99975 \times 10^{-5} + 0{,}01|$

$= 0{,}009950 00 25 \; > 10^{-4}$

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$k = 2$

$x_3 = x_2 - \dfrac{f(x_2) \cdot (x_2 - x_1)}{f(x_2) - f(x_1)}$ $= -4{,}99975 \times 10^{-5} - \left(\dfrac{-9{,}949256275 \times 10^{-7}}{0{,}019800012} \right)$

$= 2{,}512373436 \times 10^{-7}$

Pelo criterio do parada $= |x_3 - x_2| = |2{,}512373436 \times 10^{-7} + 4{,}99975 \times 10^{-5}|$

$= 5{,}024873734 \times 10^{-5} < 10^{-4}$

Logo, a raiz é

$\varepsilon \cong x_3 = 2{,}512373436 \times 10^{-7}$

3 b) $g(x) = 2x + x^2 \cdot \cos(x)$ $\varepsilon \leq 10^{-4}$ Usando $a = 0,01$ $b = -0,01$

$f(x_1) = -0,019900005$

$f(x_0) = 0,020099995$ $x_0 = a = 0,01$ $x_1 = b = -0,01$

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$k = 3$

$x_2 = x_1 - \dfrac{f(x_1) \cdot (x_1 - x_0)}{f(x_1) - f(x_0)} = -4,99975 \times 10^{-5} \times 10^{-5}$

⌐DF

Pelo criterio de parada $= |x_2 - x_1| = 0,00995000 25 \times 10^{3} > 10^{-4}$

Veja que → $f(x_0) = 0,020099995$

$f(x_1) = -0,019900005$

$f(x_2) = -9,999250025 \times 10^{-5}$

⌐DE

⇒ Logo $f(x_0) \cdot f(x_2) < 0$, usaremos os dois valores na procima iteração.

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$k = 2$

$x_3 = x_2 - \left(\dfrac{f(x_2) \cdot (x_2 - x_0)}{f(x_2) - f(x_9)} \right) = -4,999975 \times 10^{-5} - \left(\dfrac{9,069824378 \times 10^{-6}}{-0,020199987} \right)$

$x_3 = -2,487363993 \times 10^{-7}$

Pelo criterio da parada

$|x_3 - x_2| = |-2,487363993 \times 10^{-7} - 4,9998495 \times 10^{-5}| = 4,974876 36 \times 10^{-5}$

Logo, a raiz

$\varepsilon \cong x_3 = -2,487363993 \times 10^{-7}$

4)b] Nome: Jhonatan Guilherme de Oliveira Cunha   RA: 2135590

$g(x) = x^4 - 2x^3 + 2x^2 - 1 \implies g'(x) = 4x^3 - 6x^2 + 4x \qquad \xi = 0,00001$

Cotando a e b $\implies f(0,9) = -0,1819 \quad f(1,05) = 0,10525625 \qquad$ Logo $\quad a = 0,9$
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad b = 1,05$

Definindo $x_0 \implies f(a) \cdot f'(a) = -0,1819 \cdot 1,656 = -0,3012264 < 0$

$\qquad\qquad\qquad$ Logo $x_0 = b = 1,05$

$K = 0$

$x_1 = x_0 - \left(\dfrac{f(x_0)}{f'(x_0)} \right) \implies x_1 = 1,05 - \left(\dfrac{0,10525625}{2,2155} \right) \approx 1,0024900973$

Pelo critério de parada $\implies |x_1 - x_0| = |1,0024900973 - 1,05| = 0,0475099027 > 10^{-5}$

$K = 1$

$x_2 = x_1 - \left(\dfrac{f(x_1)}{f'(x_1)} \right) \implies = 1,0024900973 - \left(\dfrac{4,994386843 \times 10^{-3}}{2,010001184} \right) = 1,000000620 5$

Pelo critério de parada $\implies |x_2 - x_1| = |1,000000620 5 - 1,0024900973| = 0,0024847681 > 10^{-5}$

$K = 2$

$x_3 = x_2 - \left(\dfrac{f(x_2)}{f'(x_2)} \right) \implies x_3 = 1,000000620 5 - \left(\dfrac{1,2410077 \times 10^{-5}}{2,00002482} \right) = 1$

Pelo critério de parada $\implies |x_3 - x_2| = |1 - 1,000000620 5| = 6,204961496 \times 10^{-6}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \hookrightarrow < 10^{-5}$

Donde $\implies$
$\qquad \xi \approx 1$

4)a-

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$f(x) = 4x^3 + x + \cos x - 10$ $\varepsilon \leq 10^{-5} = 0,00001$

$f' = 12x^2 + 1 - \operatorname{sen} x$ | Cichando $[a, b] \Rightarrow$ $f(1) = -4,459697694$

$= " \underline{\quad} " \underline{\quad} " \underline{\quad} " \underline{\quad} " \underline{\quad} " \underline{\quad} " \underline{\quad}$ $f(1,5) = 5,070737202$

Logo $\Rightarrow a = 1$

$b = 1,5$

Definindo $x_0 \Rightarrow f(a) \cdot f''(a) = -54,22336381 < 0$

Logo $x_0 = b = 1,5$

$K = 0$

$x_1 = x_0 - \left(\dfrac{f(x_0)}{f'(x_0)}\right) \Rightarrow 1,5 - \left(\dfrac{4 \cdot 1,5^3 + 1,5 + \cos(1,5) - 10}{12 \cdot 1,5^2 + 1,5 - \operatorname{sen} 1,5}\right) = 1,312212341,5$

Pelo critério de parada $\Rightarrow |x_1 - x_0| = |1,312212341 - 1,5| = 0,187787659 \cdot 10^{-5}$

Logo, calculamos $x_2 =$

$x_2 = 1,312212341 = \left(\dfrac{f(x_1)}{f'(x_1)}\right) = 1,312212341 - \left(\dfrac{0,605924373}{20,6960617}\right) = 1,282935062 \cdot 10^{-5}$

Pelo critério de parada $\Rightarrow |x_2 - x_1| = |1,282935062 - 1,312212341| = 0,029277279$

Logo calculamos x_3: $1,282935062 - \left(\dfrac{0,013283292}{19,79221522}\right) = 1,282263925$

$x_3 = 1,282935062$

Pelo critério de Parada $= |x_3 - x_2| = |1,28226 3925 - 1,282935062| = 0,00067137 \cdot 10^{-5}$

Calculamos x_4

$x_4 = 1,28226 3925 - \left(\dfrac{6,87014918 \times 10^{-6}}{19,77174677}\right) = 1,282263578$

Pelo critério de Parada $\Rightarrow |x_4 - x_3| = |1,282263578 - 1,282263925|$

$= 3,47473051 \times 10^{-7} < 10^{-5}$

Donde,

$\varepsilon \cong 1,282263578$