1º

Lista 4 - Cálculo numérico

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1) Método da iteração linear (MIL)

$F(x) = x^2 - x - 2,5$ $\quad \varepsilon \leq 0,00025$ determine $[a,b] / |b-a| = 1$

I) $\left|\frac{(x_k - x_{k-1})}{2}\right| < \varepsilon$

II) $|F(x)| < \varepsilon$

raízes $[-2,-1]$ e $[2,3]$

$|b-a| = 1$ ✓ $\quad |-1+2| = 1$

$|3-2| = 1$

Raiz 1: $[-2,-1]$

Raiz 2 = $[2,3]$

$x = x^2 - 2,5$

$L(x) = x^2 - 2,5$

$L'(x) = 2x$

$|L'(x)| < 1$ $\quad |L'(x)| > 1$ X

tentativa 2.

$x = \sqrt{x+2,5}$

$L(x) = \sqrt{x+2,5}$

$L'(x) = \frac{1}{2\sqrt{x+2,5}}$

$|L'(x)| < 1$ em $[-2,-1]$ e $[2,3]$

raiz 1 $\quad L(x) = \sqrt{x+2,5}$

$x_0 = \frac{|a+b|}{2} = \frac{-3}{2}$ $\quad -1,5$

2°

raiz 1 [-2,-1]

$x_{k+1} = L(x_k) = \sqrt{x_k + 2,5}$

$x_1 = L(x_k) = \sqrt{-1,5+2,5} = 1$

$x_2 = L(x_0) = \sqrt{1+2,5} \cong 1,87083$

$x_3 = L(x_1) = \sqrt{1,87083+2,5} \cong 2,0906$

$x_4 = L(x_2) = \sqrt{2,0906+2,5} \cong 2,1425$

$x_5 = L(x_3) = \sqrt{2,1425+2,5} \cong 2,15466$

$x_6 = L(x_4) = \sqrt{2,15466+2,5} \cong 2,15746$

$x_7 = L(x_5) = \sqrt{2,15746+2,5} \cong 2,15811$

$x_8 = L(x_6) = \sqrt{2,15811+2,5} \cong 2,15826$

$x_9 = L(x_7) = \sqrt{2,15826+2,5} \cong 2,15830$

$x_{10} = L(x_8) = \sqrt{2,15830+2,5} \cong 2,15830$

number is repeating

raiz 2 [2,3]

$x_0 = \frac{2+3}{2} = \frac{5}{2} = 2,5$

$L(x) = \sqrt{x+2,5}$

$x_1 = L(x_0) = \sqrt{2,5+2,5} \cong 2,2360$

$x_2 = L(x_1) = \sqrt{2,2360+2,5} \cong 2,1762$

$x_3 = L(x_2) = \sqrt{2,1762+2,5} \cong 2,1624$

$x_4 = L(x_3) = \sqrt{2,1624+2,5} \cong 2,1592$

$x_5 = L(x_4) = \sqrt{2,1592+2,5} \cong 2,1585$

$x_6 = L(x_5) = \sqrt{2,1585+2,5} \cong 2,1583$

$x_7 = L(x_6) = \sqrt{2,1583+2,5} \cong 2,1583$

$x_8 = L(x_7) = \sqrt{2,1583+2,5} \cong 2,1583$

number repeating!

3ª

Critérios de parada

1) $\left|\frac{(x_K - x_{K-1})}{2}\right| < \varepsilon$

raiz 1: $\left|\frac{(2,15831 - 2,1583)}{2}\right| \cong 0,00001 < 0,000250$ ✓

raiz 2 $\left|\frac{(2,15831 - 2,15832)}{2}\right| \cong 0,00001 < 0,000250$ ✓

2 $|f(x)| < \varepsilon$

raiz 1

$|f(2,15831)| \cong 0,00001 < 0,00025$ ✓

raiz 2

$|f(2,15831)| \cong 0,00001 < 0,00025$ ✓

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2) Método de Newton - Raphson

$f(x) = e^x + 0,5x - 0,5$, com $\varepsilon \leq 0,000050$

intervalo $[a,b]$ / $|b-a| = 1$ raiz $[-1, 0]$

b(aos) $|b-a| = 1$

I) $\left|\frac{(x_K - x_{K-1})}{2}\right| < \varepsilon$

II) $|f(x)| < \varepsilon$

$L(2) = 2 - \frac{f(2)}{f'(2)}$

$f'(x) = e^x + 0,5$

$x_0 = \frac{a+b}{2} = -\frac{1}{2} = -0,5$

$x_{K+1} = L(x_K) = x_K - \frac{e^{x_K} - 0,5x_K - 0,5}{e^{x_K} - 0,5}$

$x_1 = L(-\frac{1}{2}) \cong -0,370343$

$x_2 = L(x_1) \cong -0,374817$

$x_3 = L(x_2) \cong -0,374823$

$\left|\frac{(-0,374823 + 0,374817)}{2}\right| = 0,000003$

$0,000003 < 0,000050$ ✓

4º $|f(x)| < \varepsilon$

$|f(-0,374823)| \cong 0,000007 < 0,000050$ ✓