Atividade 01

Entrega	@October 29, 2021
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data	@October 26, 2021

- 1.
  - a)

    $fl(\frac{1}{60}) = \frac{0.100*10^1}{0.600*10^2} = 0.166*10^{-1}$
    $fl((\frac{1}{60})^2) = (0.166*10^{-1})^2 = 0.02755600*10^{-2} = 0.276*10^{-3}$
    $fl((\frac{1}{60})^3) = (0.166*10^{-1})^3 = 0.00457429*10^{-3} = 0.457*10^{-5}$
    $fl((\frac{1}{60})^4) = (0.166*10^{-1})^4 = 0.00075933*10^{-4} = 0.759*10^{-7}$
    $fl((\frac{1}{60})^5) = (0.166*10^{-1})^5 = 0.00012604*10^{-5} = 0.123*10^{-8}$
    $fl((\frac{1}{60})^6) = (0.166*10^{-1})^6 = 0.00002092*10^{-6} = 0.209*10^{-10}$

    $fl(22*(\frac{1}{60})) = 0.220*10^2*0.166*10^{-1} = 0.03652*10^1 = 0.365$
    $fl(7*(\frac{1}{60})^2) = (0.700*10^1)(0.276*10^{-3}) = 0.1932*10^{-2} = 0.193*10^{-2}$
    $fl(42*(\frac{1}{60})^3) = (0.420*10^2)(0.457*10^{-5}) = 0.19194*10^{-3} = 0.192*10^{-3}$
    $fl(33*(\frac{1}{60})^4) = (0.330*10^2)(0.759*10^{-7}) = 0.25047*10^{-5} = 0.250*10^{-5}$
    $fl(4*(\frac{1}{60})^5) = (0.400*10^1)(0.123*10^{-8}) = 0.0492*10^{-7} = 0.492*10^{-8}$
    $fl(40*(\frac{1}{60})^6) = (0.400*10^2)(0.209*10^{-10}) = 0.0836*10^{-8} = 0.836*10^{-9}$

    $fl(1+(22*(\frac{1}{60}))) = (0.100*10^1) + (0.0365*10^1) = 0.137*10^1$
    $fl(1+(22*(\frac{1}{60})) + (7*(\frac{1}{60})^2)) = (0.137+0.000193)*10^1 = 0.137*10^1$
    $fl(1+(22*(\frac{1}{60})) + (7*(\frac{1}{60})^2) + (42*(\frac{1}{60})^3)) = (0.137+0.000193)*10^1 = 0.137*10^1$
    $fl(1+(22*(\frac{1}{60})) + (7*(\frac{1}{60})^2) + (42*(\frac{1}{60})^3) + (33*(\frac{1}{60})^4)) = (0.137+0.00000250)*10^1 = 0.137*10^1$
    $fl(1+(22*(\frac{1}{60})) + (7*(\frac{1}{60})^2) + (42*(\frac{1}{60})^3) + (33*(\frac{1}{60})^4) + (4*(\frac{1}{60})^5)) = (0.137+0.00000000492)*10^1 = 0.137*10^1$
    $fl(1+(22*(\frac{1}{60})) + (7*(\frac{1}{60})^2) + (42*(\frac{1}{60})^3) + (33*(\frac{1}{60})^4) + (4*(\frac{1}{60})^5) + 40*(\frac{1}{60})^6) = (0.137+0.000000000836)*10^1 = 0.137*10^1$

    $fl(\alpha^*)= 0.137*10^1$

  - b)

    tomando $\alpha \approx 1,36881$
    $E_R(\alpha^*) = |\frac{1.36881-1.37}{1.36881}| = |\frac{-0.00119}{1.36881}| = 0.00086936828 \approx 0.08\%$

- 2.
  - **a)**

    Calcule o valor aproximado de x_1 (x_1^*) utilizando um sistema de ponto flutuante com base 10, 4 dígitos na mantissa e arredondamento:

    a = 1 = 0.1000 x 10^1

    b = 62.10 = 0.6210 x 10^2

    c = 1 = 0.1000 x 10^1

fl(-b) = -0.6210 x 10^2

fl(b²) = (0.6210 x $10^2)^2$ = 0.385641 x 10^4 = 0.3856 x 10^4

fl(4c) = (0.4000 x 10^1) x (0.1000 x 10^1) = (0.4000 x 0.1000) x 10^2 = 0.0400 x 10^2 = 0.4000x10^1

fl(b² - 4c) = 0.3856x10^4 - 0.4000x10^1 = (0.3856 - 0.0004) x 10^4 = 0.3852 x 10^4

fl($\sqrt{b^2-4c}$) = $\sqrt{0.3852 * 10^4}$ = 0.620645 x 10^2 ⇒ 0.6206 x 10^2

fl($-b+\sqrt{b^2-4c}$) = -0.6210x10^2 + 0.6206x10^2 = (-0.6210+0.6206) x 10^2 = -0.0004 x 10^2 ⇒ -0.4000x10^{-1}

fl($\frac{-b+\sqrt{b^2-4c}}{2}$) = $\frac{-0.4000}{0.2000}$ * 10^{1-1}= -2.0 ⇒ -0.2000x10^{-1}

x_1^* =fl($\frac{b+\sqrt{b^2-4c}}{0.2000*10^1}$) = -0.2000x$10^{-1}$

- **b)**

  Erro relativo entre x_1 e x_1^*:

  $E_R(x)$ = |$\frac{-0.016107235-(-0.2000*10^{-1})}{-0.016107235}$| = 0.241678 $\approx$ 24.17%

- **c)**

  Este erro consideravelmente alto se dá ao fato da perda de duas casas decimais em fl($\sqrt{b^2-4c}$). e por causa da alta proximidade entre b e $\sqrt{b^2-4c}$.

- **d)**

  Se fizessemos uma simplificação do radical na parte superior da fórmula, poderíamos garantir que a raiz quadrada tivesse menos influência. Então, a partir da manipulação algébrica, teríamos:

  $fl($ $-b+\sqrt{b^2-4c}$) = $fl($ $\sqrt{b^2-4c}-b$) =$fl($ [$\sqrt{b^2-4c}-b$] * $\frac{\sqrt{b^2-4c}+b}{\sqrt{b^2-4c}+b}$), que por sua vez é:

  $fl(\frac{-4c}{\sqrt{b^2-4c}+b})$, e depois aplicar a divisão por 2 da fórmula de bhaskara.

- **e)**

  c = 0.1000x10^1

  $fl(-4c) = -(0.4000 * 0.1000) * 10^1 = -0.0400 * 10^2 = -0.4000 * 10^1$

  $b = 62.10 = 0.6210 * 10^2$

  $fl(b^2) =$ (0.6210 * $10^2)^2$ $= 0.385641 * 10^4 = 0.3856 * 10^4$

  $fl(b^2-4c) = 0.3856 * 10^4 - (-0.4000 * 10^1) = (0.3856 + 0.0004) * 10^4 = 0.3860 * 10^4$

  $fl(\sqrt{b^2-4c}) = \sqrt{0.3860 * 10^4} = 0.621289 * 10^2 = 0.6212 * 10^2$

  $fl(\sqrt{b^2-4c}+b) = 0.6213 * 10^2 + 0.6210 * 10^2 = (0.6213 + 0.6210) * 10^2 = 1.2423 * 10^2 = 0.1242 * 10^3$

  $fl(\frac{-4c}{\sqrt{b^2-4c}+b}) = \frac{-0.4000}{0.1242} * 10^{1-3} = -3.22061 * 10^{-2} = -0.3221 * 10^{-1}$

  tomando $z = fl(\frac{-4c}{\sqrt{b^2-4c}+b})$, agora calculamos

  $fl(\frac{z}{2}) = \frac{-0.3221*10^{-1}}{0.200*10^1} = -1.6105 * 10^{-1-1} = -0.1611 * 10^{-1}$

- **f)**

O novo erro relativo é:

$E_R(x) = |\frac{-0.016107235-(-0.1611*10^{-1})}{-0.016107235}| = 0.000171662 \approx 0.02\%$