VARIANTE “D” DA PROVA

MATRICULA 180145509

QUESTAO 1-

1.

a.

R: $\cos(0.65622) = 0.79230$

b.

Valor real da calculadora: 0.792304163

erro ABSOLUTO $= 0.792304163 - 0.79320$

erro ABSOLUTO $= 0.000004163 = 4,163 \cdot 10^{-6}$

c.

$$\cos(x) = 1 - \frac{(0,65622)^2}{2!} + \frac{(0,65622)^4}{4!} - \frac{(0,65622)^6}{6!} + \frac{(0,65622)^8}{8!} - \frac{(0,65622)^{10}}{10!}$$

$$\cos(x) = 1 - 0.21531 + 0.00772 - 0.00011 + 0.00000852 - 0.000\,000\,004 = 0.776868516$$

$$\text{erro relativo} = \frac{\text{erro absoluto}}{\text{valor real}} \therefore \text{erro absoluto} = 0.015433647$$

1-C

1_c)

$$\text{erro relativo} = \frac{\text{erro absoluto}}{\text{real}} = \frac{0.015435647}{0.792304163}$$

$$\text{erro relativo} = 0.015435647 = 1{,}5435647 \cdot 10^{-2}$$

$$\text{erro relativo} = 1{,}5435647 \cdot 10^{-2}$$

QUESTÃO 2

2

a.

$R = 254{,}5456 = \frac{254{,}5456}{2^7} \times 2^7 = 1.9886375 \times 2^7$

expoente da potencia em binário

$7 \,|\, 2$ → 1, $3 \,|\, 2$ → 1, $1 \,|\, 2$ → 1

$(7)_{(10)} = 111_{(2)}$

1,9886375 em binário

$(0{,}9886372)_{10} = (11111101)_2$

$0{,}9886375 \times 2 = 1$

$0{,}977275 \times 2 = 1$

$0{,}95455 \times 2 = 1$

$0{,}9091 \times 2 = 1$

$0{,}8182 \times 2 = 1$

$0{,}6364 \times 2 = 1$

$0{,}2728 \times 2 = 0$

$0{,}5452 \times 2 = 1$

$0{,}0$

$\boxed{1.11111101 \times 2^{111}}$

b.

mantissa: ~~com 52~~

1111 111 01

c. exponente:

7 + 1023 = 1030

1030 | 2
0 515 | 2
1 257 | 2
1 128 | 2
0 64 | 2
0 32 | 2
0 16 | 2
0 8 | 2
0 4 | 2
0 2 | 2
1

c.

exponente = 1000 000 000 0110

numero no IEE 754

sinal — exponente — mantissa →

0 1000 000 000 0110 1111 111 010 000

000 000 000 000 000 000

000 000 000 000 000 000 00

QUESTÃO 4

4

a.

$$\begin{matrix} 9 & 2 & 3 & 5 \\ 7 & 1 & 2 & 7 \\ 6 & 3 & 2 & 3 \end{matrix}$$

b.

$$\begin{matrix} 9 & 2 & 3 & 5 \\ 7 & 1 & 2 & 7 \\ 6 & 3 & 2 & 3 \end{matrix} \quad L_2 \to L_2 - \frac{7}{9}L_1$$

$$\begin{matrix} 9 & 2 & 3 & 5 \\ 0 & -\frac{5}{9} & -\frac{1}{3} & \frac{28}{9} \\ 6 & 3 & 2 & 3 \end{matrix} \quad L_3 \to L_3 - \frac{2}{3}L_1$$

$$\begin{matrix} 9 & 2 & 3 & 5 \\ 0 & -5/9 & -1/3 & 28/9 \\ 6 & 3 & 2 & 3 \end{matrix} \quad L_3 \to L_3 - (-5)L_2$$

$$\begin{matrix} 9 & 2 & 3 & 5 \\ 0 & -5/9 & -\frac{1}{3} & \frac{28}{9} \\ 0 & 0 & -1 & 9 \end{matrix}$$

$$-x_3 = 9$$

$$\boxed{x_3 = -9}$$

$$-\frac{5}{9}x_2 = \frac{28}{9} + \frac{1}{3}x_3 = \frac{28}{9} + \frac{1}{3}(-9) = \frac{1}{9}$$

$$-\frac{5}{9}x_2 = \frac{1}{9} \therefore x_2 = \frac{1}{9} \cdot \frac{9}{-5} = -\frac{1}{5} \qquad \boxed{x_2 = -\frac{1}{5}}$$

$$9x_1 = 5 - 2x_2 - 3x_3 = 5 - 2\left(\frac{-1}{5}\right) - 3\cdot(-9) = \frac{162}{5}$$

$$9x_1 = \frac{162}{5} \quad \therefore x_1 = \frac{162}{5}\cdot\frac{1}{9} = \frac{18}{5} \qquad \boxed{x_1 = \frac{18}{5}}$$

c.

R= Sendo $x_1 = x$, $x_2 = y$ e $x_3 = z$, temos

$$9x + 2y + 3z = 5 \qquad x = \frac{1}{9}(5 - 2y - 3z)$$

$$7x + y + 2z = 7$$

$$6x + 3y + 2z = 3 \qquad y = 7 - 7x - 2z$$

$$z = \frac{1}{2}(3 - 6x - 3y)$$

$$\boxed{x^{(0)} = 0,\ y^{(0)} = 0,\ z^{(0)} = 0}$$

$$x^{(1)} = \frac{1}{9}[5] = 0.5556$$

$$\cancel{y^{(1)} = 0},$$

$$y^{(1)} = 7 - 7(0.5556) = 3.111$$

$$z^{(1)} = \frac{1}{2}[3 - 6(0,5556) - 3(3.1111)]$$

$$z^{(1)} = \frac{1}{2}[-9.6667] = -4.3333$$

$$x^{(2)} = \frac{1}{9}[5 - 2(3.1111) - 3(-4.3333)] = \frac{1}{9}[13.2778] = 1.4753$$

$$y^{(2)} = 7 - 7(1.4753) - 2(-4.3333) = 6.3395$$

$$z^{(2)} = \frac{1}{2}[3 - 6(1.4753) - 3(6.3395)] = \frac{1}{2}(-24.8704) = -12.4352$$

$$x^{(3)} = \frac{1}{9}[5 - 2(6.3395) - 3(-12.4352)] = \frac{1}{9}(29.6265) = 3.2918$$

$$y^{(3)} = 7 - 7(3.2918) - 2(-12.4352) = 8.8275$$

$$z^{(3)} = \frac{1}{2}[3 - 6(3.2918) - 3(8.8275)] = \frac{1}{12}[-43.2335] = -21.6168$$

c.

$X^{0} = 0$, $Y^{(0)} = 0$, $Z^{(0)} = 0$

$x^{(1)} = 0.5556$, $y^{(1)} = 3.1111$, $z^{(1)} = -4.8333$

$x^{(2)} = 1.4753$, $y^{(2)} = 6.3395$, $z^{(2)} = -12.4352$

$x^{(3)} = 3.2918$ $y^{(3)} = 8.8275$ $z^{(3)} = -21.6168$

d. Critério de Sassenfeld

$\beta_1 = (2+3)/9 = 0.55555$

$\beta_2 = (7 \cdot (0.55555) + 2)/7 = 0.84126$

$\beta_3 = 1.211626667$

Método inviável pois $\beta_3 > 1$

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5.

$$A = \begin{matrix} 5 & -1 & -1 \\ -1 & 1 & 2 \\ -1 & 2 & 1 \end{matrix}$$

$$\begin{matrix} 5 & -1 & -1 & 1 & 0 & 0 \\ -1 & 1 & 2 & 0 & 1 & 0 \\ -1 & 2 & 1 & 0 & 0 & 1 \end{matrix} \quad L_1 \to \frac{L_1}{5} \quad \begin{matrix} 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{1}{5} & 0 & 0 \\ -1 & 1 & 2 & 0 & 1 & 0 \\ -1 & 2 & 1 & 0 & 0 & 1 \end{matrix} \quad L_2 \to L_2 - (-1)L_1$$

$$\begin{matrix} 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{1}{5} & 0 & 0 \\ 0 & \frac{4}{5} & \frac{9}{5} & \frac{1}{5} & 1 & 0 \\ -1 & 2 & 1 & 0 & 0 & 1 \end{matrix} \quad L_3 - (-1) \cdot L_1 \to L_3 \quad \begin{matrix} 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{1}{5} & 0 & 0 \\ 0 & \frac{4}{5} & \frac{9}{5} & \frac{1}{5} & 1 & 0 \\ 0 & \frac{9}{5} & \frac{4}{5} & \frac{1}{5} & 0 & 1 \end{matrix} \quad \times \frac{5}{4}$$

$$\begin{matrix} 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{1}{5} & 0 & 0 \\ 0 & 1 & \frac{9}{4} & \frac{1}{4} & \frac{5}{4} & 0 \\ 0 & \frac{9}{5} & \frac{4}{5} & \frac{1}{5} & 0 & 1 \end{matrix} \quad L_2 \to L_2 / \frac{4}{5} \quad \begin{matrix} 1 & -\frac{1}{5} & -\frac{1}{5} & 0 & 0 & \\ 0 & 1 & \frac{9}{4} & \frac{1}{4} & \frac{5}{4} & 0 \\ 0 & 0 & -\frac{13}{4} & -\frac{1}{4} & -\frac{9}{4} & 1 \end{matrix}$$

$$\begin{matrix} 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{1}{5} & 0 & 0 \\ 0 & 1 & \frac{9}{4} & \frac{1}{4} & \frac{5}{4} & 0 \\ 0 & 0 & 1 & \frac{1}{13} & \frac{9}{13} & -\frac{4}{13} \end{matrix} \quad L_2 \to L_2 - \frac{9}{4} L_3 \quad \begin{matrix} 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{1}{5} & 0 & 0 \\ 0 & 1 & 0 & \frac{1}{13} & -\frac{4}{13} & \frac{9}{13} \\ 0 & 0 & 1 & \frac{1}{13} & \frac{9}{13} & -\frac{4}{13} \end{matrix}$$

$$\begin{matrix} 1 & -\frac{1}{5} & 0 & \frac{14}{65} & \frac{9}{65} & -\frac{4}{65} \\ 0 & 1 & 0 & \frac{1}{13} & -\frac{4}{13} & \frac{9}{13} \\ 0 & 0 & 1 & \frac{1}{13} & \frac{9}{13} & -\frac{4}{13} \end{matrix} \qquad A^{-1} = \begin{matrix} 1 & 0 & 0 & \frac{14}{65} & \frac{9}{65} & -\frac{4}{65} \\ 0 & 1 & 0 & \frac{1}{13} & -\frac{4}{13} & \frac{9}{13} \\ 0 & 0 & 1 & \frac{1}{13} & \frac{9}{13} & -\frac{4}{13} \end{matrix}$$

$$L_1 \to L_1 - \left(-\frac{1}{5}\right) L_3$$

$$L_1 \to L_1 - \left(\frac{-1}{5}\right) L_2$$

$$= \begin{array}{ccc|ccc} 1 & 0 & 0 & \frac{3}{13} & \frac{1}{13} & \frac{1}{13} \\ 0 & 1 & 0 & \frac{1}{13} & \frac{-4}{13} & \frac{9}{13} \\ 0 & 0 & 1 & \frac{1}{13} & \frac{9}{13} & \frac{-4}{13} \end{array}$$

$$\boxed{A^{-1} = \begin{pmatrix} \frac{3}{13} & \frac{1}{13} & \frac{1}{13} \\ \frac{1}{13} & \frac{-4}{13} & \frac{9}{13} \\ \frac{1}{13} & \frac{9}{13} & \frac{-4}{13} \end{pmatrix}}$$

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b.

$$\begin{matrix} 5 & -1 & -1 & 5 \\ -1 & 1 & 2 & -1 \\ -1 & 2 & 1 & -2 \end{matrix} \quad L_2 \to L_2 - \left(\frac{-1}{5}\right) L_1$$

$$\begin{matrix} 5 & -1 & -1 & 5 \\ -1 & 1 & 2 & -1 \\ -1 & 2 & 1 & -2 \end{matrix} \quad \to \quad \begin{matrix} 5 & -1 & -1 & 5 \\ 0 & \frac{4}{5} & \frac{9}{5} & 0 \\ -1 & 2 & 1 & -2 \end{matrix}$$

$$\begin{matrix} 5 & -1 & -1 & 5 \\ 0 & \frac{4}{5} & \frac{9}{5} & 0 \\ -1 & 2 & 1 & -2 \end{matrix} \quad L_3 \to L_3 - \left(\frac{-1}{5}\right) L_1$$

$$\begin{matrix} 5 & -1 & -1 & 5 \\ 0 & \frac{4}{5} & \frac{9}{5} & 0 \\ 0 & \frac{9}{5} & \frac{4}{5} & -1 \end{matrix} \qquad \begin{matrix} 5 & -1 & -1 & 5 \\ 0 & \frac{4}{5} & \frac{9}{5} & 0 \\ 0 & 0 & -\frac{13}{4} & 1 \end{matrix}$$

$$-\frac{13}{4} \cdot x_3 = -1 \quad \therefore \quad x_3 = -1 \cdot \frac{4}{-13} = \boxed{\frac{4}{13}}$$

$$\frac{4}{5} \cdot x_2 = \frac{-9}{5} x_3 = \frac{-9}{5} \cdot \frac{4}{13} = \frac{-36}{65} \quad \therefore \quad x_2 = \frac{-36}{65} \cdot \frac{5}{4} = \boxed{\frac{-9}{13}}$$

$$\boxed{x_2 = -9/13} \qquad 5x_1 + x_2 + x_3 = 5 + \left(\frac{-9}{13}\right) + \frac{4}{13} = \frac{60}{13}$$

$$\therefore \quad 5x_1 = \frac{60}{13} \quad \therefore \quad \boxed{x_1 = \frac{12}{13}}$$

$$X = \begin{pmatrix} 12/13 \\ -9/13 \\ 4/13 \end{pmatrix}$$