1. $\overrightarrow{AB} \cdot \overrightarrow{BC} = 2 \times 2 \times \cos(120^\circ) = 2 \times 2 \times \left(-\dfrac{1}{2}\right) = -2$

Opção (B)

2.

2.1. $\overrightarrow{AB} = B - A = (3, -1) - (1, -2) = (2, 1)$

$m = \dfrac{1}{2}$, então $\alpha = \tan^{-1}\left(\dfrac{1}{2}\right) \simeq 27^\circ$

Opção (A)

2.2. $m = \dfrac{-1}{\dfrac{1}{2}} = -2$

$y = -2x + b$, então $-1 = -6 + b \Leftrightarrow b = 5$

$s: y = -2x + 5$

3. $\overrightarrow{CA} \cdot \overrightarrow{CB} = 3 \times 3 \times \cos(180^\circ) = -9$

Opção (B)

4. $\vec{n_1}(5, -k+3, 0)$ e $\vec{n_2}(k, 2, 1)$

$\vec{n_1} \cdot \vec{n_2} = 0 \Leftrightarrow 5k - 2k + 6 = 0 \Leftrightarrow k = -2$

Opção (A)

5. Vetor colinear com $\vec{n}(0, 4, -3)$

Reta que passa no ponto de coordenadas $(1, 2, -1)$

$\begin{cases} 1 = 1 \\ 2 = -2 - 4k \\ -1 = 2 + 3k \end{cases} \Leftrightarrow \begin{cases} \\ k = -1 \\ k = -1 \end{cases}$

Opção (C)

6. $3x + y - z + 5 = 0$

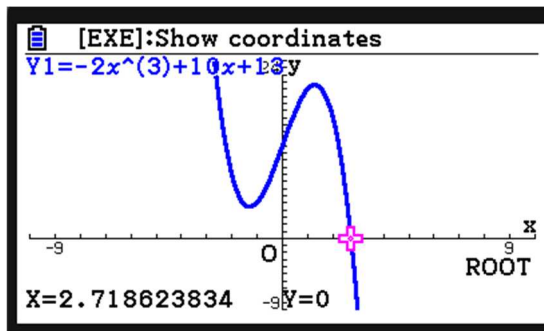**6.1.** $\vec{n}(3, 2, -2)$ e $B(0, 6, 0)$

$3x + 2y - 2z + d = 0$

$0 + 12 - 0 + d = 0 \Leftrightarrow d = -12$

$ABG: 3x + 2y - 2z - 12 = 0$

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6.2. $(x, y, z) = (0, 6, 0) + k(3, 2, -2)$, $k \in \mathbb{R}$

$\Leftrightarrow (x, y, z) = (3k, 6 + 2k, -2k)$, $k \in \mathbb{R}$

$C = (3k, 6 + 2k, -2k)$, $k \in \mathbb{R}$, $k \in \mathbb{R}$

$C \in CDH$

$3(3k) + 2(6 + 2k) - 2(-2k) + 5 = 0 \Leftrightarrow 17k = -17 \Leftrightarrow k = -1$

$C(-3, 4, 2)$

6.3. $\overrightarrow{OF} = (10, 4, 13)$ e $\left\| \overrightarrow{OF} \right\| = \sqrt{10^2 + 4^2 + 13^2} = \sqrt{285}$

$\overrightarrow{OB} = (0, 6, 0)$ e $\left\| \overrightarrow{OB} \right\| = 6$

$\overrightarrow{OF} \cdot \overrightarrow{OB} = (10, 4, 13) \cdot (0, 6, 0) = 24$

$\cos\left(F\hat{O}B \right) = \dfrac{24}{\sqrt{285} \times 6}$

Daqui resulta que: $F\hat{O}B = \cos^{-1}\left(\dfrac{4}{\sqrt{285}} \right) \simeq 76°$

6.4. $\overrightarrow{OP} = (x, x^3, 1)$

$\overrightarrow{BF} = F - B = (10, 4, 13) - (0, 6, 0) = (10, -2, 13)$

$\overrightarrow{OP} \cdot \overrightarrow{BF} = 0 \Leftrightarrow (x, x^3, 1) \cdot (10, -2, 13) = 0 \Leftrightarrow 10x - 2x^3 + 13 = 0$

$x \approx 2,71$

7.

$\overrightarrow{AN} \cdot \overrightarrow{DM} = \left(\overrightarrow{AB} + \overrightarrow{BN} \right) \cdot \left(\overrightarrow{DA} + \overrightarrow{AM} \right) = \overrightarrow{AB} \cdot \overrightarrow{DA} + \overrightarrow{AB} \cdot \overrightarrow{AM} + \overrightarrow{BN} \cdot \overrightarrow{DA} + \overrightarrow{BN} \cdot \overrightarrow{AM} =$

$= 0 + c \times \dfrac{c}{2} \times 1 + \left(\dfrac{3}{4} \times 2c \right) \times 2c \times (-1) + 0$

$= \dfrac{c^2}{2} - 3c^2$

$= -\dfrac{5}{2}c^2$

2