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CTII348

Determinantes - Matriz de Ordem 1, 2 e 3

① a) $\begin{vmatrix} 2 & 3 \\ 1 & 5 \end{vmatrix} = 10 - 3 = 7$

b) $\begin{vmatrix} -2 & -4 \\ 3 & 6 \end{vmatrix} = -12 - (-12) = 0$

c) $\begin{vmatrix} 3 & -1 & 1 \\ 2 & 1 & -1 \\ 1 & 4 & -2 \end{vmatrix} = 3 - (-7) = 10$

d) $\begin{vmatrix} 3 & 2 & -1 \\ 2 & 3 & 1 \\ 1 & 1 & 1 \end{vmatrix} = 36 - 16 = 20$

② $A = \begin{vmatrix} a_{11} & a_{21} & a_{31} \\ a_{12} & a_{22} & a_{32} \\ a_{13} & a_{23} & a_{33} \end{vmatrix}$

$a_{ij} = -3, \text{ se } i=j$

$a_{ij} = 0, \text{ se } i \neq j$

$a_{11} = -3 \quad a_{21} = 0 \quad a_{31} = 0$

$a_{12} = 0 \quad a_{22} = -3 \quad a_{32} = 0$

$a_{13} = 0 \quad a_{23} = 0 \quad a_{33} = -3$

$A = \begin{vmatrix} -3 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & -3 \end{vmatrix} = -27$

(A)

$$\begin{array}{l}
 x^2 + 12x + 9 \\
 \textcircled{3} \quad \begin{vmatrix} x & 1 & x \\ 3 & x & 4 \\ 1 & 3 & 3 \end{vmatrix} = -3 \quad \begin{cases} 3x^2 + 9x + 4 - (x^2 + 12x + 9) \\ 3x^2 + 9x + 4 - x^2 + 12x - 9 \\ 2x^2 - 3x - 5 = -3 \\ 2x^2 - 3x - 2 = 0 \end{cases} \\
 x & 1 & x & 3x^2 + 9x + 4 \\
 3 & x & 4
 \end{array}$$

$$2x^2 - 3x - 2 = 0$$

$$\Delta = (-3)^2 - 4 \cdot 2 \cdot (-2)$$

$$\Delta = 9 + 16$$

$$\Delta = 25$$

$$x = \frac{-(-3) \pm \sqrt{25}}{2 \cdot 2} = \frac{3 \pm 5}{4}$$

$$x_1 = 8/4 = 2$$

(E)

$$x_2 = -2/4 = -1/2$$

$$\begin{array}{l}
 \textcircled{4} \quad \begin{vmatrix} x-1 & -1 & 0 \\ 0 & x+1 & -1 \\ 2 & -1 & x+1 \end{vmatrix} \rightarrow \begin{cases} 2(x+1) \cdot 0 = 0 \\ 0(x-1) \cdot (-1) \cdot (-1) = x+1 \cdot (-1) = x-1 \\ 0 \cdot (-1) \cdot (x+1) = 0 \\ (x-1) \cdot (x+1) \cdot (x+1) = x^3 + x^2 - x - 1 \\ 0 \cdot (-1) \cdot 0 = 0 \\ 2 \cdot (-1) \cdot (-1) = 2 \end{cases} \\
 x-1 & -1 & 0 \\
 0 & x+1 & -1 \\
 2 & -1 & x+1
 \end{array}$$

$$x^3 + x^2 - x - 1 + 0 + 2 = x^3 + x^2 + x + 1$$

$$0 + x - 1 + 0 = x - 1$$

$$x^3 - x^2 - x + 1 - (x - 1) = 2$$

$$x^3 + x^2 - x + 1 - x + 1 - 2 = 0$$

$$x^3 + x^2 - 2x = 0$$

$$a \quad b \quad c$$

$$-\frac{b}{a} \rightarrow -\frac{-1}{1} = 1$$

(C)

⑤ $A = \begin{bmatrix} a_{11} & a_{21} \\ a_{12} & a_{22} \\ a_{13} & a_{23} \end{bmatrix}$ $B = \begin{bmatrix} b_{11} & b_{21} & b_{31} \\ b_{12} & b_{22} & b_{32} \end{bmatrix}$ $3j = 2i - 3j$
 $b_{jk} = R - j$

$a_{11} = 2 \cdot 1 - 3 \cdot 1 = -1$ $a_{21} = 2 \cdot 2 - 3 \cdot 1 = 1$ $b_{11} = 1 - 1 = 0$ $b_{21} = 1 - 2 = -1$ $b_{31} = 1 - 3 = -2$

$a_{12} = 2 \cdot 1 - 3 \cdot 2 = -4$ $a_{22} = 2 \cdot 2 - 3 \cdot 2 = -2$ $b_{12} = 2 - 1 = 1$ $b_{22} = 2 - 2 = 0$ $b_{32} = 2 - 3 = -1$

$a_{13} = 2 \cdot 1 - 3 \cdot 3 = -7$ $a_{23} = 2 \cdot 2 - 3 \cdot 3 = -5$

$7 \cdot 0 - 5 \cdot 8 = 12$

$-2 \cdot 0 + 7 \cdot 0 - 3 \cdot 8 =$

$B = \begin{bmatrix} 0 & -1 & -2 \\ 1 & 0 & -1 \end{bmatrix}$

$AB = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ -2 & 4 & 10 & 2 & 4 \\ -5 & 7 & 19 & -5 & 7 \end{bmatrix}$

$A = \begin{bmatrix} -1 & 1 & 0+1 & 1+0 & 2-1 \\ -4 & -2 & 0+2 & 4+0 & 8+2 \\ -7 & -5 & 0-5 & 7+0 & 14+5 \end{bmatrix}$

(C)

$7 \cdot 6 - 5 \cdot 0 = 14$

$7 \cdot 6 - 6 \cdot 4 = 12$

$112 - 112 = 0$

⑥ $A = \begin{bmatrix} 2 & 0 & -1 \\ -1 & 1 & 0 \end{bmatrix}$

$B = \begin{bmatrix} 1 & -1 \\ -1 & 1 \\ 0 & 2 \end{bmatrix}$

$\begin{bmatrix} 1 & -1 \\ -1 & 1 \\ 0 & 2 \end{bmatrix}$

$A \cdot B = \begin{bmatrix} 2 & -1 \\ -2 & 2 \end{bmatrix} =$

$\begin{bmatrix} 2 & 0 & -1 \\ -1 & 1 & 0 \end{bmatrix} \begin{bmatrix} 2+0+0 & -2+0-2 \\ -1-1+0 & +1+1+0 \end{bmatrix}$

$= 4 - 8 = -4$

(D)