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зад 1. и започната зад.2

зад 1

$A.B' - 3C = ?$

$A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 0 & 1 \end{pmatrix}$ $B = \begin{pmatrix} 0 & 2 & 4 \\ 1 & 3 & 5 \end{pmatrix}$ $C = \begin{pmatrix} 1 & 0 \\ 2 & 5 \end{pmatrix}$

$B' = \begin{pmatrix} 0 & 1 \\ 2 & 3 \\ 4 & 5 \end{pmatrix}$ $3C = \begin{pmatrix} 3 & 0 \\ 6 & 15 \end{pmatrix}$

$A.B' = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 0 & 1 \end{pmatrix} . \begin{pmatrix} 0 & 1 \\ 2 & 3 \\ 4 & 5 \end{pmatrix} =$

$= \begin{pmatrix} 1.0 + 2.2 + 3.4 & 1.1 + 2.3 + 3.5 \\ 4.0 + 0.2 + 1.4 & 4.1 + 0.3 + 1.5 \end{pmatrix} =$

$= \begin{pmatrix} 16 & 22 \\ 4 & 9 \end{pmatrix}$

$A.B' - 3C = \begin{pmatrix} 16 & 22 \\ 4 & 9 \end{pmatrix} - \begin{pmatrix} 3 & 0 \\ 6 & 15 \end{pmatrix} = \begin{pmatrix} 13 & 22 \\ -2 & -6 \end{pmatrix}$

зад 2

$A = \begin{pmatrix} 0 & 1 & 0 \\ -3 & 0 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ $A^{-1} = ?$

продължение на зад 2.

$$\det A = \begin{vmatrix} 0 & 1 & 0 \\ -3 & 0 & 0 \\ 0 & 0 & 2 \end{vmatrix} \begin{matrix} 0 & 1 \\ -3 & 0 \\ 0 & 0 \end{matrix} = -2(-3)(1) = 6 \neq 0$$

$$A_{11} = \begin{vmatrix} 0 & 0 \\ 0 & 2 \end{vmatrix} = 0 \qquad A_{21} = -\begin{vmatrix} 1 & 0 \\ 0 & 2 \end{vmatrix} = -2$$

$$A_{12} = -\begin{vmatrix} -3 & 0 \\ 0 & 2 \end{vmatrix} = 6 \qquad A_{22} = 0$$

$$A_{13} = \begin{vmatrix} -3 & 0 \\ 0 & 0 \end{vmatrix} = 0 \qquad A_{23}\ 0$$

$$\cancel{A} = \qquad A_{31} = 0$$

$$A_{32} = 0$$

$$A_{33} = \begin{vmatrix} 0 & 1 \\ -3 & 0 \end{vmatrix} = 3$$

$$\boxed{A^{-1} = \frac{1}{6}\begin{pmatrix} 0 & -2 & 0 \\ 6 & 0 & 0 \\ 0 & 0 & 3 \end{pmatrix}}$$

$$\underbrace{\begin{pmatrix} 0 & 1 & 0 \\ -3 & 0 & 0 \\ 0 & 0 & 2 \end{pmatrix}}_{A} X = \underbrace{\begin{pmatrix} 1 & 2 & -3 \end{pmatrix}}_{B}$$

$$X = A^{-1} . B$$

$$X = \frac{1}{6}\begin{pmatrix} 0 & -2 & 0 \\ 6 & 0 & 0 \\ 0 & 0 & 3 \end{pmatrix} . \begin{pmatrix} 1 & 2 & -3 \end{pmatrix}$$

$$X = \frac{1}{6}\begin{pmatrix} 1 & 2 & -3 \end{pmatrix}\begin{pmatrix} 0 & -2 & 0 \\ 6 & 0 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

завършена зад.2 и започната зад.3

$$X = \frac{1}{6}\begin{pmatrix} 1 & 2 & -3 \end{pmatrix}\begin{pmatrix} 0 & -2 & 0 \\ 6 & 0 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

$$\cancel{X} = \frac{1}{6}\begin{pmatrix} 1.0 + 2.6 + (-3).0 & 1(-2) + 2.0 + (-3).0 & 1.0 + 2.0 + (-3)(3) \end{pmatrix}$$

$$= \boxed{\frac{1}{6}\begin{pmatrix} 12 & -2 & -9 \end{pmatrix}}$$

зад 3

$$\begin{cases} x_1 + x_2 + 2x_3 = -1 \\ 2x_1 - x_2 + 2x_3 = -4 \\ 4x_1 + x_2 + x_3 = -1 \end{cases}$$

$$\overline{A} = \left(\begin{array}{ccc|c} 1 & 1 & 2 & -1 \\ 2 & -1 & 2 & -4 \\ 4 & 1 & 1 & -1 \end{array}\right) (-2)\,(-4) \sim$$

$$\sim \left(\begin{array}{ccc|c} 1 & 1 & 2 & -1 \\ 0 & -3 & -2 & -2 \\ 0 & -3 & -7 & 3 \end{array}\right) (-1) \sim$$

$$\sim \left(\begin{array}{ccc|c} 1 & 1 & 2 & -1 \\ 0 & -3 & -2 & -2 \\ 0 & 0 & -5 & 5 \end{array}\right)$$

$r A = r \overline{A} = 3 \Rightarrow$ има решение

завършена зад.3 и започната зад.4

$$\begin{cases} x_1 + x_2 + 2x_3 = -1 \\ -3x_2 - 2x_3 = -2 \\ -5x_3 = 5 \end{cases}$$

$x_3 = -1$

$-3x_2 + 2 = -2$

$-3x_2 = -4$

$x_2 = \frac{4}{3}$

$x_1 + \frac{4}{3} - 2 = -1$

$3x_1 + 4 - 6 = -3$

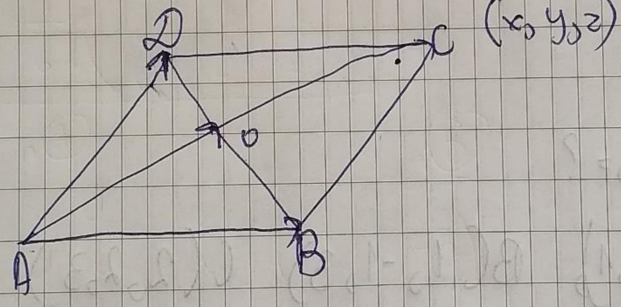
$3x_1 - 2 = -3$

$3x_1 = -1$

$x_1 = -\frac{1}{3}$

Отг. $\left(-\frac{1}{3}, \frac{4}{3}, -1\right)$

зад 4



$A(-2, 1, 3)$ $B(5, -1, 3)$ $D(4, 3, 0)$

C коорд = ?, O коорд ?

$\overrightarrow{AB}(7, -2, 0)$ $\overrightarrow{AD}(6, 2, -3)$

$\overrightarrow{AC} = \overrightarrow{AD} + \overrightarrow{AB}$ $\overrightarrow{AC}(13, 0, -3)$

$x = 7 + 6 = 13$

$y = -2 + 2 = 0$

$z = 0 - 3 = -3$

$x + 2 = 13$

$x = 11$

$y - 1 = 0$

$y = 1$

$z - 3 = -3$

$z = 0$

завършена зад.4 и започната зад.5

$\boxed{C(11, 1, 0)}$

$\vec{AO} = \frac{1}{2}\vec{AC}$

$\vec{AO}\left(\frac{13}{2}\right.$

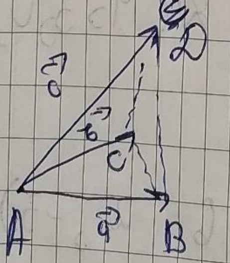
$O\left(\frac{x_B+x_D}{2}, \frac{y_B+y_D}{2}, \frac{z_B+z_D}{2}\right)$

$\boxed{O\left(\frac{9}{2}, 1, \frac{3}{2}\right)}$

зад 5

$V_{\text{тетр } ABCD} = ?$

$A(1, 3, 1)$, $B(1, -1, 3)$ $C(2, 2, 3)$ $D(1, 1, 0)$



$V = \frac{1}{6}\left|(\vec{a}\,\vec{b}\,\vec{c})\right|$

$\vec{AB}(0, -4, 2)$

$\vec{AC}(1, -1, 2)$

$\vec{AD}(0, -2, -1)$

завършена зад.5

$$\vec{a}\ \vec{b}\ \vec{c} = \begin{vmatrix} 0 & -4 & 2 \\ 1 & -1 & 2 \\ 0 & -2 & -1 \end{vmatrix} \begin{matrix} 0 & -4 \\ 1 & -1 \\ 0 & -2 \end{matrix} =$$

$$= 2.(1).(-2) - (-1)(1)(-4) = -4 - 4 = -8$$

$$\boxed{V_{ABCD} = \frac{1}{\cancel{6}_3} \cdot \cancel{8}^4 = \frac{4}{3}}$$

$$V = \frac{1}{3} S_{ABC} h_D$$

$$S_{ABC} = \frac{1}{2} |\vec{AB} \times \vec{AC}|$$

$$\vec{AB} \times \vec{AC} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 0 & -4 & 2 \\ 1 & -1 & 2 \end{vmatrix} \begin{matrix} \vec{i} & \vec{j} \\ 0 & -4 \\ 1 & -1 \end{matrix} =$$

$$= -8\vec{i} + 2\vec{j} + 4\vec{k} + 2\vec{i} =$$

$$= -6\vec{i} + 2\vec{j} + 4\vec{k}$$

$$|\vec{AB} \times \vec{AC}| = \sqrt{56} = 2\sqrt{14}$$

$$S_{ABC} = \frac{1}{\cancel{2}} \cancel{2}\sqrt{14} = \sqrt{14}$$

$$\frac{4}{3} = \frac{1}{3}\sqrt{14} \cdot h_D \qquad \frac{4}{3} = \frac{\sqrt{14}}{3} h_D \qquad \sqrt{14} h_D = 4$$

$$h_D = \frac{4}{\sqrt{14}} \cdot \frac{\sqrt{14}}{\sqrt{14}}$$

$$\boxed{h_D = \frac{2\sqrt{14}}{7}}$$