

1. Let \mathcal{P} be the plane passing through the points $A(1, 1, 1)$, $B(2, 0, 0)$ and $C(1, 6, 3)$. Let ℓ be the line through the point $D(4, 5, 16)$ and perpendicular to the plane \mathcal{P} .
 - (a) Find an equation of the plane \mathcal{P} in standard form.
 - (b) Find parametric equations of the line ℓ in vector and scalar forms.
 - (c) Find the point of intersection of the plane \mathcal{P} and the line ℓ .
 - (d) Find the distance from the point D to the plane \mathcal{P} .

2. Find all points of intersection of the planes $\mathcal{P}_1: 7x + 3y - 4z = 2$ and $\mathcal{P}_2: 2x + y - 3z = -3$. Explain the geometrical significance of your answer.

3. Given the matrices

$$A = \begin{pmatrix} 2 & 5 & -1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 2 & 2 \\ 0 & -1 & 1 \end{pmatrix}, \quad C = (2 \quad -5 \quad 1), \quad D = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$
$$E = \begin{pmatrix} -2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 2 & 0 \end{pmatrix}, \quad F = \begin{pmatrix} 3 & 4 \\ 0 & -1 \\ 0 & 0 \end{pmatrix}, \quad G = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \quad \text{and} \quad H = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & -4 \end{pmatrix},$$

- (a) identify the matrices of each of the following types:
square, diagonal, identity, zero, column, row, upper triangular, lower triangular;
- (b) evaluate or declare as undefined: $B^T - F$, $C + G$, $3E + 2H$.