VARIANT 1

Full name:	Group:

Task:	1	2	3	4	5	6	7	Total
Score:								

1. (4 points) Find the distance from the point $(1, 1, -1)$ to the line of intersection of the planes $x + y + z = 1$ and $2x - y - 5z = 1$.

2. (4 points) Two vertices of a triangle are $(4, -3)$ and $(-2, 5)$. If the orthocenter (intersection of altitudes) of the triangle is at $(1, 2)$, find the coordinates of the third vertex.

3. (5 points)

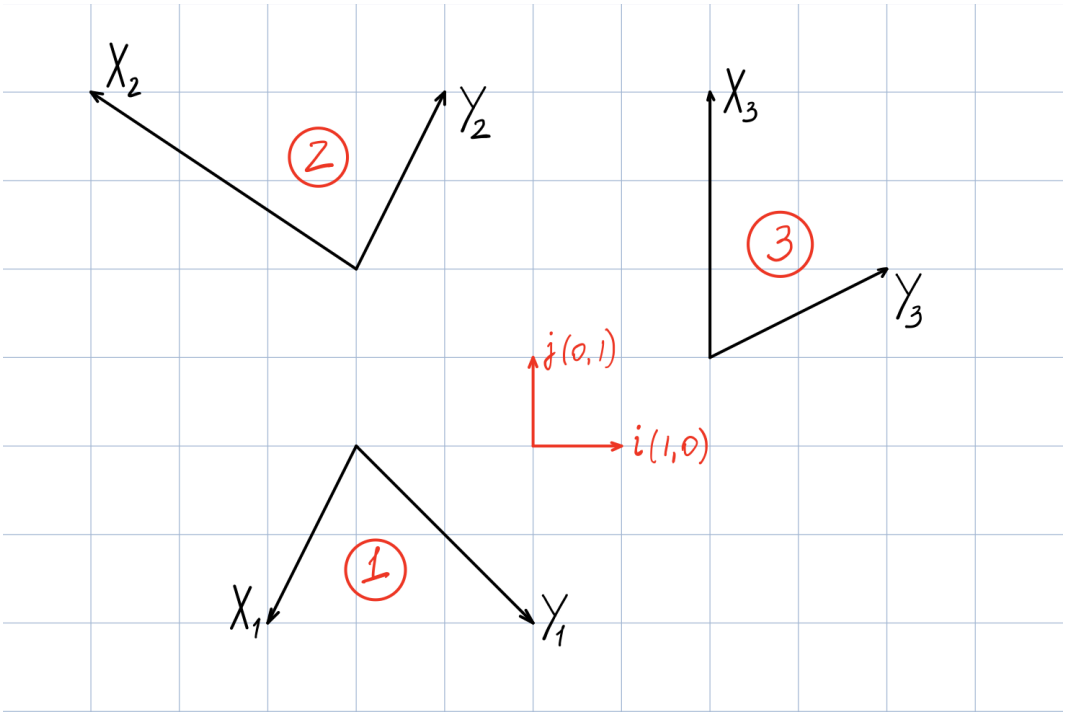
   (a) Solve the system $\mathbf{Aw} = \mathbf{b}$, where $\mathbf{w} = (\text{x,y,z})$. $\mathbf{A} = \begin{bmatrix} 1 & -3 & 1 \\ -1 & 2 & -5 \\ 5 & -13 & 13 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 4 \\ 3 \\ 8 \end{bmatrix}$

   (b) Draw relative positions of the planes that correspond to equations.

4. (5 points) Find the distance between the parallel planes $2x-y+2z+2 = 0$, $6x-3y+6z-4 = 0$.

5. (5 points) Diagonals of a rhombus intersect at point $M(1; 2)$, the longest of them being parallel to a horizontal axis. The side of the rhombus equals 2 and its obtuse angle is $120°$. Compose the equations of the sides of this rhombus in canonical form.

6. (6 points) Find the transition matrix from basis $(\mathbf{x_1}, \mathbf{y_1})$ to the basis $(\mathbf{x_2}, \mathbf{y_2})$.



7. (6 points) Apex S of a regular quadrilateral pyramid (four edges form a base, all base edges are equal) $SABCD$ has coordinates $(0, 0, 0)$ in some Cartesian coordinate system. It's also known that vertices A and C have coordinates $(-3, 2, -6)$ and $(1, 4, 2)$ respectively.

   (a) Find coordinates of vertices B and C.

   (b) Find the volume of the pyramid.

   (c) Find the distance from vertex A to the plane CDS.

   (d) Find the distance between lines AB and DS.

VARIANT 2

Full name:	Group:

Task:	1	2	3	4	5	6	7	8	Total
Score:									

1. (4 points) Find the distance from the point $(1, 1, -1)$ to the line of intersection of the planes $x + y + z = 1$ and $2x - y - 5z = 1$.

2. (4 points) Two vertices of a triangle are $(4, -3)$ and $(-2, 5)$. If the orthocenter (intersection of altitudes) of the triangle is at $(1, 2)$, find the coordinates of the third vertex.

3. (5 points)

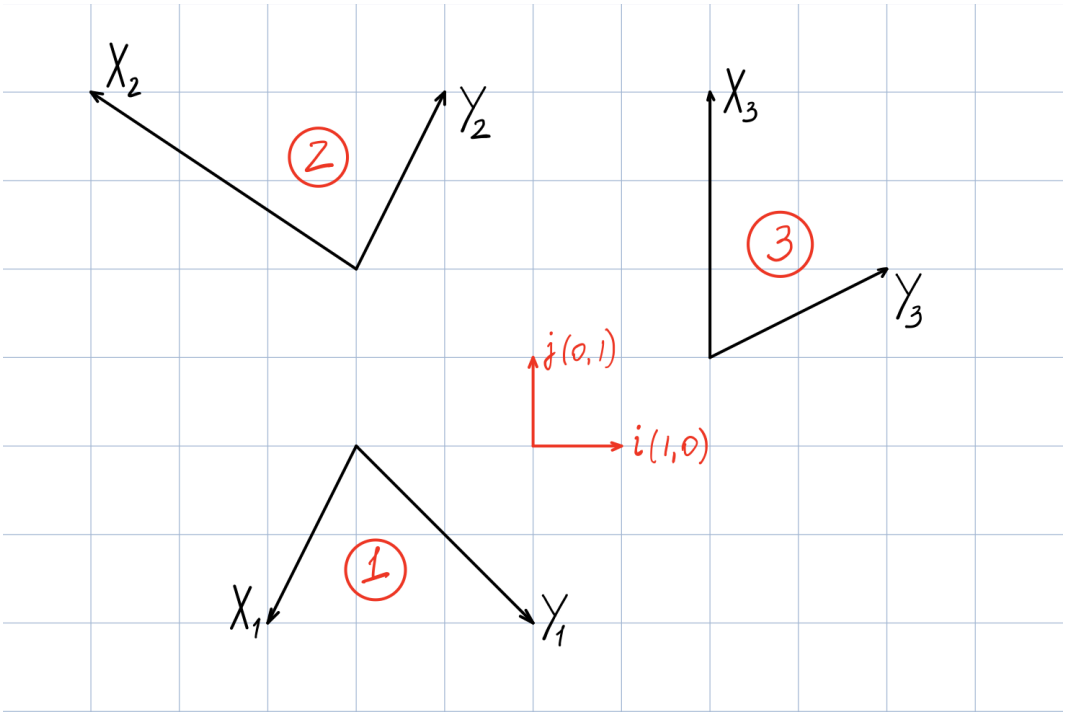
   (a) Solve the system $\mathbf{Aw} = \mathbf{b}$, where $\mathbf{w} = (\text{x,y,z})$. $\mathbf{A} = \begin{bmatrix} 1 & -3 & 1 \\ 1 & -2 & 5 \\ 5 & -13 & 13 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 4 \\ -5 \\ 8 \end{bmatrix}$

   (b) Draw relative positions of the planes that correspond to equations.

4. (5 points) Find the distance between the parallel planes $x+2y+2z-4 = 0$, $3x+6y+6z+1 = 0$.

5. (5 points) Diagonals of a rhombus intersect at point $M(1; 2)$, the longest of them being parallel to a vertical axis. The side of the rhombus equals 2 and its obtuse angle is $120°$. Compose the equations of the sides of this rhombus in parametric form.

6. (6 points) Find the transition matrix from basis $(\mathbf{x_2}, \mathbf{y_2})$ to the basis $(\mathbf{x_3}, \mathbf{y_3})$.



7. (6 points) Apex S of a regular quadrilateral pyramid (four edges form a base, all base edges are equal) $SABCD$ has coordinates $(0, 0, 0)$ in some Cartesian coordinate system. It's also known that vertices A and C have coordinates $(-3, 2, -6)$ and $(1, 4, 2)$ respectively.

   (a) Find coordinates of vertices B and C.

   (b) Find the volume of the pyramid.

   (c) Find the distance from vertex A to the plane CDS.

   (d) Find the distance between lines AB and DS.

VARIANT 3

Full name:	Group:

Task:	1	2	3	4	5	6	7	8	Total
Score:									

1. (4 points) Find the distance from the point $(1, 1, -1)$ to the line of intersection of the planes $x + y + z = 1$ and $2x - y - 5z = 1$.

2. (4 points) Two vertices of a triangle are $(4, -3)$ and $(-2, 5)$. If the orthocenter (intersection of altitudes) of the triangle is at $(1, 2)$, find the coordinates of the third vertex.

3. (5 points)

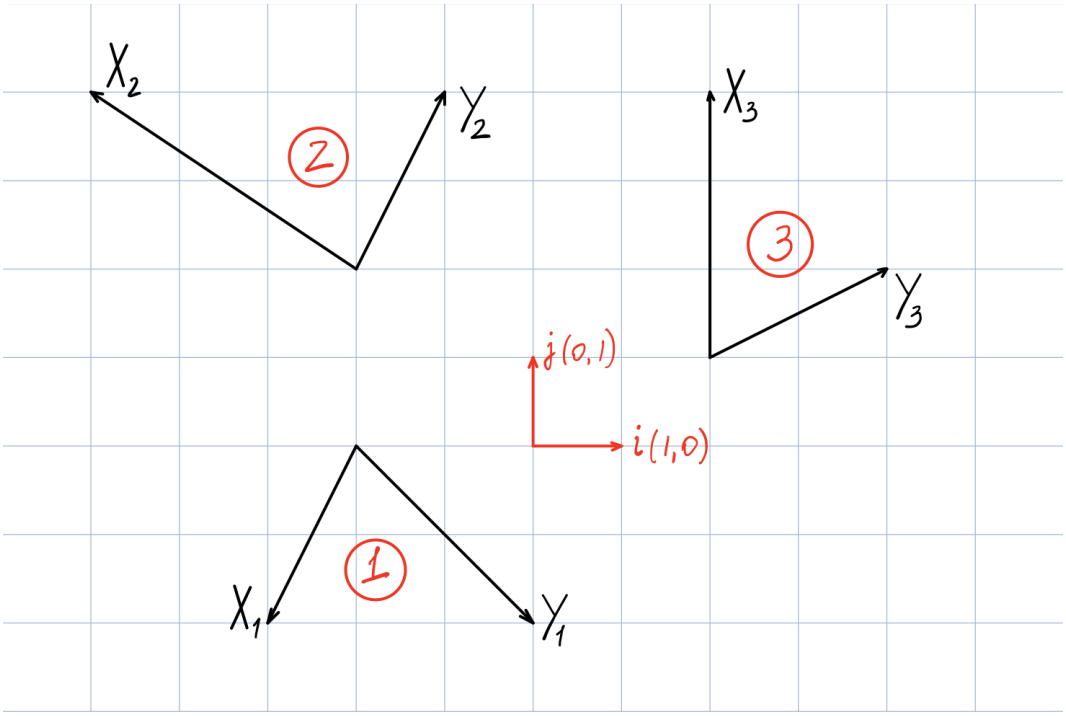
   (a) Solve the system $\mathbf{Aw} = \mathbf{b}$, where $\mathbf{w} = (\text{x,y,z})$. $\mathbf{A} = \begin{bmatrix} 1 & -3 & 1 \\ 1 & -1 & -1 \\ 5 & -13 & 13 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 4 \\ 2 \\ 8 \end{bmatrix}$

   (b) Draw relative positions of the planes that correspond to equations.

4. (5 points) Find the distance between the parallel planes $2x+y-2z+5 = 0$, $4x+2y-4z+3 = 0$.

5. (5 points) Diagonals of a rhombus intersect at point $M(2; 1)$, the longest of them being parallel to a horizontal axis. The side of the rhombus equals 2 and its obtuse angle is $120°$. Compose the equations of the sides of this rhombus in general form.

6. (6 points) Find the transition matrix from basis $(\mathbf{x_3}, \mathbf{y_3})$ to the basis $(\mathbf{x_1}, \mathbf{y_1})$.



7. (6 points) Apex S of a regular quadrilateral pyramid (four edges form a base, all base edges are equal) $SABCD$ has coordinates $(0, 0, 0)$ in some Cartesian coordinate system. It's also known that vertices A and C have coordinates $(-3, 2, -6)$ and $(1, 4, 2)$ respectively.

   (a) Find coordinates of vertices B and C.

   (b) Find the volume of the pyramid.

   (c) Find the distance from vertex A to the plane CDS.

   (d) Find the distance between lines AB and DS.

VARIANT 4

Full name:	Group:

Task:	1	2	3	4	5	6	7	8	Total
Score:									

1. (4 points) Find the distance from the point $(1, 1, -1)$ to the line of intersection of the planes $x + y + z = 1$ and $2x - y - 5z = 1$.

2. (4 points) Two vertices of a triangle are $(4, -3)$ and $(-2, 5)$. If the orthocenter (intersection of altitudes) of the triangle is at $(1, 2)$, find the coordinates of the third vertex.

3. (5 points)

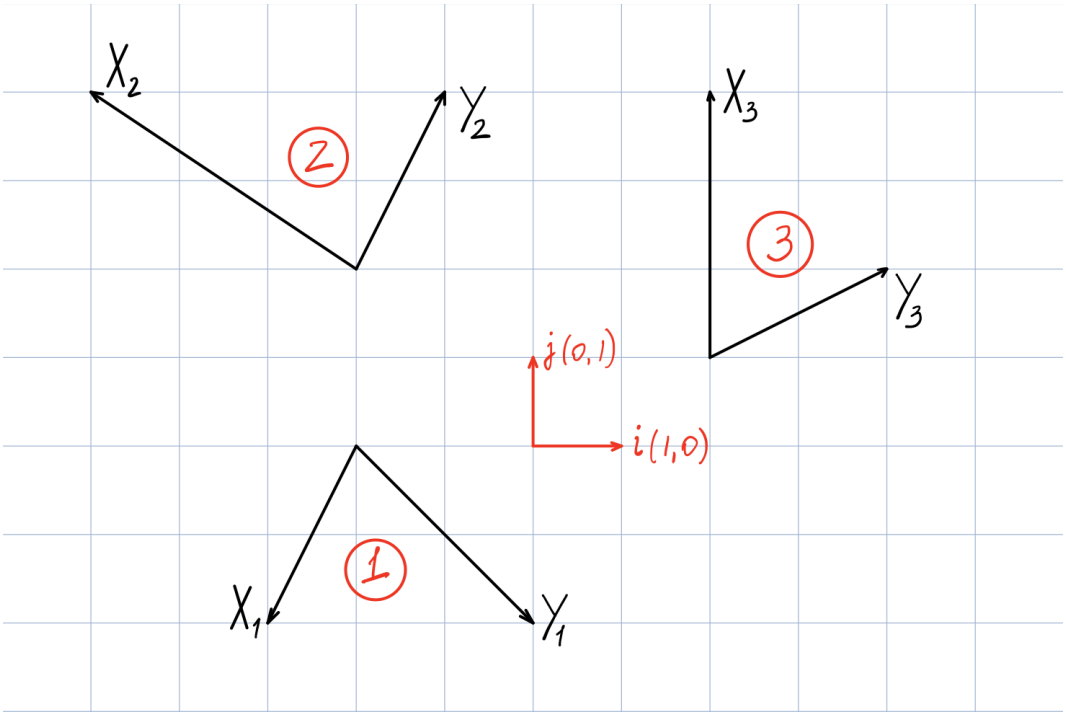
   (a) Solve the system $\mathbf{Aw} = \mathbf{b}$, where $\mathbf{w} = (\text{x,y,z})$. $\mathbf{A} = \begin{bmatrix} 2 & 1 & -3 \\ 2 & 1 & 1 \\ 2 & 1 & -1 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 4 \\ 4 \\ 4 \end{bmatrix}$

   (b) Draw relative positions of the planes that correspond to equations.

4. (5 points) Find the distance between the parallel planes $2x-2y-z-3 = 0$, $6x-6y-3z-2 = 0$.

5. (5 points) Diagonals of a rhombus intersect at point $M(-1; -2)$, the longest of them being parallel to a vertical axis. The side of the rhombus equals 2 and its obtuse angle is $120°$. Compose the equations of the sides of this rhombus in slope intercept form.

6. (6 points) Find the transition matrix from basis $(\mathbf{x_3}, \mathbf{y_3})$ to the basis $(\mathbf{x_2}, \mathbf{y_2})$.



7. (6 points) Apex S of a regular quadrilateral pyramid (four edges form a base, all base edges are equal) $SABCD$ has coordinates $(0, 0, 0)$ in some Cartesian coordinate system. It's also known that vertices A and C have coordinates $(-3, 2, -6)$ and $(1, 4, 2)$ respectively.

   (a) Find coordinates of vertices B and C.

   (b) Find the volume of the pyramid.

   (c) Find the distance from vertex A to the plane CDS.

   (d) Find the distance between lines AB and DS.