

Full name: _____

Group: _____

Task:	1	2	3	4	5	Extra	Total
Score:							_____ of 30 pts. ____ extra

- (6 points) Find the equation of a plane which is perpendicular to the plane $x + 4y - 3z + 7 = 0$ and crosses the straight line $\frac{x-2}{5} = \frac{y-3}{1} = \frac{z+1}{2}$.
- (6 points) There are three points $A(4\mathbf{i} + \mathbf{j} + 2\mathbf{k})$, $B(2\mathbf{i})$, $C(-2\mathbf{i} + 3\mathbf{j} - 5\mathbf{k})$. Find the equation of the triangle's altitude passing through the point B .
- (6 points) Solve the system
 - $\mathbf{A}\mathbf{w} = \mathbf{b}$,
 where $\mathbf{w} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$, $\mathbf{A} = \begin{bmatrix} 1 & -3 & 1 \\ -1 & 2 & -5 \\ 5 & -13 & 13 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 4 \\ 3 \\ 8 \end{bmatrix}$.
 - Find rank of the matrix A .
 - Explain relative positions of the planes that correspond to equations.
- (6 points) In the triangle ABC points K , L , M are placed on the sides AB , BC and AC respectively such that $AK : KB = 2 : 1$, $BL : LC = 4 : 1$, $CM : MA = 3 : 1$. Find the transition matrix from the basis \overrightarrow{AC} , \overrightarrow{AB} to the basis \overrightarrow{ML} , \overrightarrow{KL} . Express new basis vectors in terms of the old ones using matrix-vector notation.
- (6 points) The coordinates of the vertices of a tetrahedron are given: $A(3, 2, 1)$, $B(1, 4, -2)$, $C(3, 7, 6)$, $D(5, 8, 4)$. Find the coordinates of the intersection of the altitude dropped down from the vertex B to the plane ACD and its length. The answer may contain roots.
- (Extra, 5 points) Draw figure that represents the set of points of the plane (x, y) which satisfies the inequality $x^3 + xy^2 \geq x$.

AGLA 2022. MIDTERM. II VARIANT

Full name: _____ | Group: _____

Task:	1	2	3	4	5	Extra	Total
Score:							_____ of 30 pts. ____ extra

- (6 points) Find the equation of a plane which is perpendicular to the plane $x + 5y - 3z + 12 = 0$ and crosses the straight line $\frac{x-4}{6} = \frac{y-9}{1} = \frac{z-5}{3}$
- (6 points) There are three points $A(2\mathbf{i} + 4\mathbf{j} + 2\mathbf{k})$, $B(3\mathbf{i})$, $C(-2\mathbf{i} + \mathbf{j} - 5\mathbf{k})$. Find the equation of the triangle altitude passing through the point B.
- (6 points) Solve the system
 - $\mathbf{A}\mathbf{w} = \mathbf{b}$,
 where $\mathbf{w} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$, $\mathbf{A} = \begin{bmatrix} 1 & 2 & 1 \\ -2 & -3 & 1 \\ 9 & 15 & 0 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$.
 - Find rank of the matrix A .
 - Explain relative positions of the planes that correspond to equations.
- (6 points) In the triangle ABC points K , L , M are placed on the sides AB , BC and AC respectively such that $AK : KB = 4 : 1$, $BL : LC = 3 : 2$, $CM : MA = 1 : 3$. Find the transition matrix from the basis \overrightarrow{CA} , \overrightarrow{AB} to the basis \overrightarrow{LK} , \overrightarrow{ML} . Express new basis vectors in terms of the old ones using matrix-vector notation.
- (6 points) The coordinates of the vertices of a tetrahedron are given: $A(3, 2, 1)$, $B(1, 4, -2)$, $C(3, 7, 6)$, $D(5, 8, 4)$. Find the coordinates of the intersection of the altitude dropped down from the vertex C to the plane ABD and its length. The answer may contain roots.
- (Extra, 5 points) Draw figure that represents the set of points of the plane (x, y) which satisfies the inequality $y^3 + yx^2 \geq y$.