AGLA 1. 2022. Retake of MIDTERM. 35 points, 120 minutes

Full name:	Group:

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

In each sheet, you **should** write your last name, first name, variant number, and group number in the **upper right** corner. Unsigned sheets or sheets without the information above will NOT BE graded.

1. (6 points) Find the equation of the straight line concurrent with the lines $2x + 3y = 3$ and $x + 2y = 2$ and also concurrent with the lines $3x - y = 1$ and $x + 5y = 11$.

2. (6 points) There are three points $A(2\mathbf{i}+4\mathbf{j}+2\mathbf{k}), B(3\mathbf{i}), C(-2\mathbf{i}+1\mathbf{j}-5\mathbf{k}))$. Find the equation of the triangle's altitude passing through the point B.

3. (6 points) Solve the system

   (a) $\mathbf{Aw} = \mathbf{b}$,

   where $\mathbf{w} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ $\mathbf{A} = \begin{bmatrix} 1 & -3 & 1 \\ 1 & -1 & -1 \\ 5 & -13 & 13 \end{bmatrix}$, $\mathbf{b} = \begin{bmatrix} 4 \\ 2 \\ 8 \end{bmatrix}$.

   (b) Find rank of the matrix A.

   (c) Explain relative positions of the planes that correspond to equations.

4. (6 points) Points P and Q belong to sides AB and AC of a triangle ABC respectively, and $AP : PB = 2 : 3$, $AQ : QC = 1 : 2$.

   (a) Find the transition matrix from basis $\overrightarrow{AC}, \overrightarrow{BC}$ to basis $\overrightarrow{BQ}, \overrightarrow{PC}$.

   (b) Find coordinates $(x'; y')$ of point M in coordinate system $\overrightarrow{BQ}, \overrightarrow{PC}$ given its coordinates $(x; y)$ in CS $\overrightarrow{AC}, \overrightarrow{BC}$.

5. (6 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. (Extra, 5 points) Find the condition that one of the lines given by $ax^2 + 2hxy + by^2 = 0$ may be perpendicular to one of the lines given by $a_1x^2 + 2h_1xy + by^2 = 0$. And draw the picture.