1. Graph the following system of linear inequalities:

$$\begin{cases} y - x \geq 1 \\ y + x \geq 2 \\ y \leq 3 \end{cases}$$

2. A straight line passes through two points $(1, 1)$ and $(2, 3)$.

(a) Calculate the slope of this line.

(b) What is the corresponding equation of this straight line?

(c) Find out the x-intercept and y-intercept of this line.

(d) Is this line perpendicular to the line $y = x + 1$? Explain your answer.

(e) Is this line parallel to the line $y = 2x + 1$? Explain your answer.

3. (a) Show that three points $(1, 1)$, $(1, -1)$ and $(-1, -1)$ are not on the same line.

(b) For what value of k will the three points $(1, 5)$, $(2, 7)$ and $(3, k)$ be on the same line?

4. (a) Solve the following system of linear equations using Gaussian elimination method:

$$\begin{cases} x + 2y = 3 \\ 2x + y = 4 \end{cases}$$

(b) Give an example that a system of linear equation has no solutions at all.

5. Perform the following matrix multiplication

(a)
$$\begin{bmatrix} 3 & 2 & 4 \end{bmatrix} \cdot \begin{bmatrix} -3 \\ -1 \\ -9 \end{bmatrix}$$

(b)
$$\begin{bmatrix} 3 & 2 & -1 \\ 1 & 0 & -1 \end{bmatrix} \cdot \begin{bmatrix} 0 & -3 \\ 2 & -1 \\ 3 & -5 \end{bmatrix}$$