1. Let $A$ be an $n \times n$ invertible matrix. Prove that if $u, v, w$ are 3 linearly independent vectors in $\mathbb{R}^n$ then $Au, Av, Aw$ are also linearly independent.

2. Find the inverse of the matrix $A = \begin{bmatrix} -1 & -1 \\ 1 & 2 \end{bmatrix}$.

3. A linear mapping $T$ from $\mathbb{R}^2$ to $\mathbb{R}^3$ is represented by a matrix $A$ (‘standard matrix’). What size is this matrix? Determine $A$ if we know that

$$
T \left( \begin{bmatrix} -1 \\ 1 \end{bmatrix} \right) = \begin{bmatrix} 3 \\ 0 \\ -1 \end{bmatrix} \quad \text{and} \quad T \left( \begin{bmatrix} -1 \\ 2 \end{bmatrix} \right) = \begin{bmatrix} 5 \\ 1 \\ 0 \end{bmatrix}
$$

[Hint: If $A$ is the sought matrix the above conditions can be written as $A[u_1, u_2] = [v_1, v_2]$. You can now use the inverse, so $A = ...$]