1. Write down the definition of linear dependence and use it to show that the set

$$S = \left\{ \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \right\}$$

is linearly dependent.

2. True or false:
(a) Invertible matrices have linearly independent columns.
(b) $\text{im}(T)$ is spanned by the rows of the matrix A, where $T(x) = Ax$.
(c) Invertible matrices always induce invertible linear transformations, i.e. if $A \in \mathbb{R}^{n \times n}$ is invertible, then $T(x) = Ax$ defines an invertible map (injective and surjective).
(d) $T : \mathbb{R}^2 \to \mathbb{R}^4$ is a linear map. T cannot be injective (one-to-one).