

Quiz 2

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1. Consider an $m \times n$ matrix A . Below are two possible attributes of A :

- Attribute 1: A has m pivot rows.
- Attribute 2: A has n pivot columns.

Each of the statements below is equivalent to attribute 1 or attribute 2. Indicate which one:

- (a) The columns of A are linearly independent.
- (b) The equation $A\vec{x} = \vec{b}$ is consistent for every $\vec{b} \in \mathbb{R}^m$.
- (c) The mapping $T : \mathbb{R}^n \rightarrow \mathbb{R}^m$ defined by $T(\vec{x}) = A\vec{x}$ is onto.
- (d) The columns of A span \mathbb{R}^m .
- (e) A has no free variables.
- (f) If the equation $A\vec{x} = \vec{b}$ is consistent, then there is a unique solution.
- (g) The equation $A\vec{x} = \vec{0}$ has only the trivial solution.
- (h) The mapping $T : \mathbb{R}^n \rightarrow \mathbb{R}^m$ defined by $T(\vec{x}) = A\vec{x}$ is one-to-one.

2. Let $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$ be a linear transformation. Also suppose that the following equations are true:

$$T\left(\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}\right) = \begin{bmatrix} -2 \\ 3 \end{bmatrix} \quad T\left(\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}\right) = \begin{bmatrix} -5 \\ 1 \end{bmatrix} \quad T\left(\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}\right) = \begin{bmatrix} 7 \\ -4 \end{bmatrix}$$

What is the standard matrix for T ?