Handwritten HW 8

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20. Let $\mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$, $\mathbf{v}_1 = \begin{bmatrix} -2 \\ 5 \end{bmatrix}$, and $\mathbf{v}_2 = \begin{bmatrix} 7 \\ -3 \end{bmatrix}$, and let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation that maps $\mathbf{x}$ into $x_1\mathbf{v}_1 + x_2\mathbf{v}_2$. Find a matrix A such that $T(\mathbf{x})$ is $A\mathbf{x}$ for each $\mathbf{x}$.

Solution:

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22. Mark the statement True or False (T/F). Justify your answer.
Every matrix transformation is a linear transformation.

Solution:

24. Mark the statement True or False (T/F). Justify your answer.
The codomain of the transformation $\mathbf{x} \mapsto A\mathbf{x}$ is the set of all linear combinations of the columns of A.

Solution:

26. Mark the statement True or False (T/F). Justify your answer.
If $T : \mathbb{R}^n \to \mathbb{R}^m$ is a linear transformation and if $\mathbf{c}$ is in $\mathbb{R}^m$, then a uniqueness question is "Is $\mathbf{c}$ in the range of T?"

Solution:

28. Mark the statement True or False (T/F). Justify your answer.
A linear transformation preserves the operations of vector addition and scalar multiplication.

Solution: