Question 1 *Suppose T is a linear transformation defined by $T(\vec{x}) = A\vec{x}$ and*
$T\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = A\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4x + 7y \\ 8y \\ 2x - y \end{bmatrix}$. *Then the standard matrix A for this linear transformation is:*

$A = \begin{bmatrix} \boxed{4} & \boxed{7} \\ \boxed{0} & \boxed{8} \\ \boxed{2} & \boxed{-1} \end{bmatrix}$

Question 2 *A mapping $T : \mathbf{R^n} \to \mathbf{R^m}$ is said to be onto $\mathbf{R^m}$ if each $\vec{b}$ in $\mathbf{R^m}$ is the image of at least one $\vec{x}$ in $\mathbf{R^n}$. Decide which of the following transformations is onto.*

$T(\vec{x}) = A\vec{x}$ *where* $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Multiple Choice:

  (a) *onto* ✓

  (b) *not onto*

$T(\vec{x}) = A\vec{x}$ *where* $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \end{bmatrix}$

Multiple Choice:

  (a) *onto* ✓

  (b) *not onto*

$T(\vec{x}) = A\vec{x}$ *where* $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \\ 0 & 0 \end{bmatrix}$

Multiple Choice:

  (a) *onto*

  (b) *not onto* ✓

Question 3 *True/False: Let $T : \mathbf{R^n} \to \mathbf{R^m}$ be a linear transformation. Then T is one-to-one if and only if the equation $T(\vec{x}) = \vec{0}$ has only the trivial solution.*

Multiple Choice:

   (a) *True* ✓

   (b) *False*

Question 4 *Decide which of the following transformations is one-to-one. (Hint: Use the true/false statement above.)*

$T(\vec{x}) = A\vec{x}$ where $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Multiple Choice:

   (a) *one-to-one* ✓

   (b) *not one-to-one*

$T(\vec{x}) = A\vec{x}$ where $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \end{bmatrix}$

Multiple Choice:

   (a) *one-to-one*

   (b) *not one-to-one* ✓

$T(\vec{x}) = A\vec{x}$ where $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \\ 0 & 0 \end{bmatrix}$

Multiple Choice:

   (a) *one-to-one* ✓

   (b) *not one-to-one*