1-8

September 14, 2025

Find the domain and comdomain of the transformation $T_A(x) = Ax$.

1 a)

A has size 3×2.

Find the domain and codomain defined by the equations.

3 b)

$$w_1 = 5x_1 - 7x_2$$
$$w_2 = 6x_1 + x_2$$
$$w_3 = 2x_1 + 3x_2$$

Find the domain and codomain of the transformation defined by the matrix product.

5 a)

$$\begin{bmatrix} 3 & 1 & 2 \\ 6 & 7 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Find the domain and codomain of the transformation T defined by the equations.

7 a)

$$T(x_1, x_2) = (2x_1 - x_2, x_1 + x_2)$$

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$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} 4x_1 \\ x_1 - x_2 \\ 3x_2 \end{bmatrix}$$

Find the standard matrix for the operator $T : R^3 \to R^3$ defined by,

$$w_1 = 3x_1 + 5x_2 - x_3$$
$$w_2 = 4x_1 - x_2 + x_3$$
$$w_3 = 3x_1 + 2x_2 - x_3$$

and then compute $T(-1, 2, 4)$ by directly sustituing the equations and then by matrix multiplication.

15 "In Exercises 17–18 find the standard matrix for the transformation and use it to compute $T(\mathbf{x})$. Check your result by substituting directly in the formula for T."

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$$(a) \qquad\qquad\qquad T(x_1, x_2) = (-x_1 + x_2, x_2); \qquad \mathbf{x} = (-1, 4)$$
$$(b) \qquad T(x_1, x_2, x_3) = (2x_1 - x_2 + x_3, x_2 + x_3, 0); \qquad \mathbf{x} = (2, 1, -3)$$

Find $T_A(x)$ and express your answer in matrix form.

19 b)

$$A = \begin{bmatrix} -1 & 2 & 0 \\ 3 & 1 & 5 \end{bmatrix}; \; \mathbf{x} = \begin{bmatrix} -1 \\ 1 \\ 3 \end{bmatrix}$$

Show that T is a matrix transformation but using the previous Theorem of homogenaity and linear transformation.

21 a)

$$T(x, y) = (2x + y, x - y)$$

Show that T is not a matrix transformation.

23 a)

$$T(x, y) = (x^2, y)$$