
Problem 1. **(1 point)**

Determine whether the product Ax is defined or undefined.

[?] 1. $A = \begin{bmatrix} -5 & -2 & 1 & 3 & -4 \end{bmatrix}, x = \begin{bmatrix} 10 \\ -10 \\ 9 \\ 1 \\ -3 \end{bmatrix}$

[?] 2. $A = \begin{bmatrix} -7 & -9 \\ -3 & -6 \\ -4 & 7 \end{bmatrix}, x = \begin{bmatrix} 1 \\ -4 \\ 1 \end{bmatrix}$

[?] 3. $A = \begin{bmatrix} -1 & -6 & -5 & 6 \\ 10 & 9 & -6 & -4 \\ 6 & 0 & -6 & 5 \end{bmatrix}, x = \begin{bmatrix} 2 \\ -10 \\ -1 \\ 3 \end{bmatrix}$

[?] 4. $A = \begin{bmatrix} 4 & 7 & 7 \\ -5 & 5 & 6 \end{bmatrix}, x = \begin{bmatrix} 8 \\ -8 \\ -10 \\ -4 \end{bmatrix}$

[?] 5. $A = \begin{bmatrix} 7 & 10 & 9 \\ 6 & -3 & -8 \\ -7 & 6 & -5 \\ 9 & -9 & 4 \end{bmatrix}, x = \begin{bmatrix} 3 \\ 3 \\ -9 \end{bmatrix}$

Answer(s) submitted:

- DEFINED
- UNDEFINED
- DEFINED
- UNDEFINED
- DEFINED

submitted: (correct)
recorded: (correct)

Problem 2. **(1 point)**

Compute the following product.

$$\begin{bmatrix} -1 & 5 & 6 \\ -5 & 9 & 3 \\ -3 & 9 & -3 \end{bmatrix} \begin{bmatrix} -2 \\ 3 \\ -1 \end{bmatrix} = \begin{bmatrix} \_\_\_ \\ \_\_\_ \\ \_\_\_ \end{bmatrix}$$

Answer(s) submitted:

- $\begin{bmatrix} 11 \\ 34 \\ 36 \end{bmatrix}$

submitted: (correct)
recorded: (correct)

Problem 3. **(1 point)**

Find a value of k for which $\vec{w} = \begin{bmatrix} -14 \\ -9 \\ k \end{bmatrix}$ is a linear combination of $\vec{v}_1 = \begin{bmatrix} -4 \\ -3 \\ -1 \end{bmatrix}$ and $\vec{v}_2 = \begin{bmatrix} 2 \\ 2 \\ -1 \end{bmatrix}$.

$k =$ ________

Answer(s) submitted:

- -8

submitted: (correct)
recorded: (correct)

Problem 4. **(1 point)**

Let

$$A = \begin{bmatrix} 1 & 7 \\ 7 & 6 \\ -3 & -4 \end{bmatrix}.$$

Define the linear transformation $T : \mathbb{R}^2 \to \mathbb{R}^3$ by $T(\vec{x}) = A\vec{x}$. Find the images of $\vec{u} = \begin{bmatrix} -5 \\ -4 \end{bmatrix}$ and $\vec{v} = \begin{bmatrix} a \\ b \end{bmatrix}$ under T.

$T(\vec{u}) = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$

$T(\vec{v}) = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$

Answer(s) submitted:

- $\begin{bmatrix} -33 \\ -59 \\ 31 \end{bmatrix}$
- $\begin{bmatrix} a+7b \\ 7a+6b \\ -3a-4b \end{bmatrix}$

submitted: (correct)
recorded: (correct)

Problem 5. **(1 point)**

Let $\vec{e}_1 = (1,0)$, $\vec{e}_2 = (0,1)$, $\vec{x}_1 = (-4,2)$ and $\vec{x}_2 = (9,-8)$.

Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation that sends $\vec{e}_1$ to $\vec{x}_1$ and $\vec{e}_2$ to $\vec{x}_2$. If T maps $(-2,6)$ to the vector $\vec{y}$, then

$\vec{y} =$ ______.

(Enter your answer as an ordered pair, such as (1,2), including the parentheses.)

Answer(s) submitted:

- $(62, -52)$

submitted: (correct)
recorded: (correct)

Problem 6. **(1 point)**

Suppose that a linear transformation T satisfies

$$T(\mathbf{u}_1) = \begin{bmatrix} -6 \\ -8 \\ -3 \end{bmatrix}, \quad T(\mathbf{u}_2) = \begin{bmatrix} -5 \\ -8 \\ -4 \end{bmatrix}$$

Find: $T(4\mathbf{u}_1 - 2\mathbf{u}_2) = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$

Answer(s) submitted:

- $\begin{bmatrix} -14 \\ -16 \\ -4 \end{bmatrix}$

submitted: (correct)
recorded: (correct)

Problem 7. **(1 point)**

Determine if each of the following functions T is a linear transformation. *(Note that because the first three parts of this are multiple choice partial correct answers are not shown for this problem.)*

(a) $T(x_1, x_2, x_3) = (1, x_1)$
• ?
• is a linear transformation
• is not a linear transformation

(b) $T(x_1, x_2, x_3) = (-(2+4)x_1 + x_2 + x_3, 0)$
• ?
• is a linear transformation
• is not a linear transformation

(c) $T(x_1, x_2, x_3) = (0, -5x_1x_3)$
• ?
• is a linear transformation
• is not a linear transformation

The function $T(x_1, x_2, x_3) = (2x_1, 4x_3)$ is a linear transformation. give the matrix A such that $T(\mathbf{x}) = A\mathbf{x}$:

$A = \begin{bmatrix} \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \end{bmatrix}$

Answer(s) submitted:

- is not a linear transformation
- is a linear transformation
- is not a linear transformation
- $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

submitted: (correct)
recorded: (correct)

Problem 8. **(1 point)**

Find an example of a linear transformation $T : \mathbf{R}^2 \to \mathbf{R}^3$ given by $T(\mathbf{x}) = A\mathbf{x}$ such that

$$T\left(\begin{bmatrix} 0 \\ 1 \end{bmatrix}\right) = \begin{bmatrix} 5 \\ 5 \\ 4 \end{bmatrix}.$$

$A = \begin{bmatrix} \_\_ & \_\_ \\ \_\_ & \_\_ \\ \_\_ & \_\_ \end{bmatrix}$

Answer(s) submitted:

- $\begin{bmatrix} 1 & 5 \\ 1 & 5 \\ 1 & 4 \end{bmatrix}$

submitted: (correct)
recorded: (correct)

Problem 9. **(1 point)**

Let

$$\vec{x} = \begin{bmatrix} a \\ b \end{bmatrix}, \ \vec{v} = \begin{bmatrix} -3 \\ -1 \end{bmatrix}, \text{ and } \vec{w} = \begin{bmatrix} 9 \\ -2 \end{bmatrix}.$$

Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation defined by mapping every $\vec{x} = \begin{bmatrix} a \\ b \end{bmatrix}$ to $a\vec{v} + b\vec{w}$. Find a matrix A such that $T(\vec{x}) = A\vec{x}$.

$A = \begin{bmatrix} \_\_ & \_\_ \\ \_\_ & \_\_ \end{bmatrix}$

Answer(s) submitted:

- $\begin{bmatrix} -3 & 9 \\ -1 & -2 \end{bmatrix}$

submitted: (correct)
recorded: (correct)