Week 7 Conceptual Quiz

Tim Palacios (timpalacios)

full credit by February 25, 2026, 11:59:00 PM MST, closes March 11, 2026, 11:59:00 PM MDT

Section: MATH301 001

This PDF is available for convenience. Assignments must be submitted within **WeBWorK** for credit.

Problem 1. **(1 point)**
Let $S : \mathbb{R}^4 \to \mathbb{R}^2$ and $T : \mathbb{R}^4 \to \mathbb{R}^2$ be linear transformations with

$$S\left(\begin{bmatrix} 0 \\ 1 \\ -4 \\ 9 \end{bmatrix}\right) = \begin{bmatrix} 3 \\ 1 \end{bmatrix} \quad \text{and} \quad T\left(\begin{bmatrix} 0 \\ 1 \\ -4 \\ 9 \end{bmatrix}\right) = \begin{bmatrix} -6 \\ 4 \end{bmatrix}.$$

What is $(-4S + 3T)\left(\begin{bmatrix} 0 \\ 1 \\ -4 \\ 9 \end{bmatrix}\right)$?

- A. $\begin{bmatrix} -12 \\ -4 \end{bmatrix}$
- B. $\begin{bmatrix} -18 \\ 12 \end{bmatrix}$
- C. $\begin{bmatrix} 0 \\ -1 \\ 4 \\ -9 \end{bmatrix}$
- D. $\begin{bmatrix} -30 \\ 8 \end{bmatrix}$
- E. We do not have enough information to find this value.

Correct Answers:

- D

Problem 2. **(2 points)**
Answer the following questions.

What elementary row operation does left multiplication by the matrix $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ perform?

- A. $R_1 \leftrightarrow R_2$
- B. $R_2 \leftrightarrow R_3$
- C. $R_1 \leftrightarrow R_3$
- D. Left multiplication by this matrix does not perform an elementary row operation.

What elementary row operation does left multiplication by the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 4 \\ 0 & 0 & 1 \end{bmatrix}$ perform?

- A. $4R_3 + R_2 \leftrightarrow R_3$
- B. $4R_2 + R_3 \leftrightarrow R_3$
- C. $4R_3 + R_2 \leftrightarrow R_2$
- D. $4R_2 + R_3 \leftrightarrow R_2$
- E. Left multiplication by this matrix does not perform an elementary row operation.

Correct Answers:

- C
- C

Problem 3. **(2 points)**
Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be an invertible linear transformation such that

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

Which of the following must be true? Select all that apply.

- A. $T^{-1}\left(\begin{bmatrix} 3 \\ -3 \end{bmatrix}\right) = \begin{bmatrix} 5 \\ 1 \end{bmatrix}$
- B. $T\left(T^{-1}\left(\begin{bmatrix} -5 \\ -7 \end{bmatrix}\right)\right) = \begin{bmatrix} -5 \\ -7 \end{bmatrix}$
- C. $T^{-1}\left(\begin{bmatrix} -2 \\ 4 \end{bmatrix}\right) = \begin{bmatrix} -5 \\ -7 \end{bmatrix}$
- D. $T\left(T^{-1}\left(\begin{bmatrix} -5 \\ -7 \end{bmatrix}\right)\right) = \begin{bmatrix} 3 \\ -3 \end{bmatrix}$
- E. $T\left(\begin{bmatrix} -2 \\ 4 \end{bmatrix}\right) = \begin{bmatrix} -5 \\ -7 \end{bmatrix}$
- F. None of the above statements must be true.

Correct Answers:

- ABE