Week 3 Conceptual Quiz

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Section: MATH301 001

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Problem 1. **(1 point)**
Which of the following most accurately describes what it means to add two vectors $\vec{v}$ and $\vec{w}$, represented as arrows, in $\mathbb{R}^3$?

- A. Place the tip of $\vec{w}$ on the tip of $\vec{v}$ and draw an arrow from the base of $\vec{v}$ to the base of $\vec{w}$.
- B. Place the base of $\vec{w}$ on the tip of $\vec{v}$ and draw an arrow from the base of $\vec{v}$ to the tip of $\vec{w}$.
- C. Place the base of $\vec{w}$ on the tip of $\vec{v}$ and draw an arrow from the base of $\vec{w}$ to the tip of $\vec{v}$.
- D. Place the tip of $\vec{v}$ on the tip of $\vec{w}$ and draw an arrow from the base of $\vec{w}$ to the base of $\vec{v}$.

Correct Answers:

- B

Problem 2. **(1 point)**
Let

$$\vec{v} = \begin{bmatrix} 9 \\ 10 \\ 4 \\ 5 \end{bmatrix} \quad \text{and} \quad \vec{w} = \begin{bmatrix} 9 \\ -8 \\ 8 \\ 5 \end{bmatrix}.$$

What is $-8\vec{v} + 5\vec{w}$?

- A. $\begin{bmatrix} -27 \\ 114 \\ -44 \\ -15 \end{bmatrix}$
- B. $\begin{bmatrix} -27 \\ -120 \\ 8 \\ -15 \end{bmatrix}$
- C. $\begin{bmatrix} 117 \\ -14 \\ 84 \\ 65 \end{bmatrix}$
- D. $\begin{bmatrix} -117 \\ -40 \\ -72 \\ -65 \end{bmatrix}$

Correct Answers:

- B

Problem 3. **(1 point)**
A linear system in the variables x_1, x_2, x_3, x_4, and x_5 has the following solution set:

$$\begin{aligned} x_1 &= 15 + 16s + 14t \\ x_2 &= t \\ x_3 &= -5 - 19s \\ x_4 &= s \\ x_5 &= -27 \end{aligned}$$

Rewrite the solution set as a vector equation.

- A. $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} 15 \\ 0 \\ -5 \\ 0 \\ -27 \end{bmatrix} + s \begin{bmatrix} 16 \\ 0 \\ -19 \\ 1 \\ 0 \end{bmatrix} + t \begin{bmatrix} 14 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}$
- B. $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} 15 \\ 1 \\ -5 \\ 1 \\ -27 \end{bmatrix} + s \begin{bmatrix} 16 \\ 0 \\ -19 \\ 1 \\ 0 \end{bmatrix} + t \begin{bmatrix} 14 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}$
- C. $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} 15 \\ 1 \\ -5 \\ 1 \\ -27 \end{bmatrix} + s \begin{bmatrix} 16 \\ 0 \\ -19 \\ 0 \\ 0 \end{bmatrix} + t \begin{bmatrix} 14 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$
- D. $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} 15 \\ 0 \\ -5 \\ 0 \\ -27 \end{bmatrix} + s \begin{bmatrix} 16 \\ 0 \\ -19 \\ 0 \\ 0 \end{bmatrix} + t \begin{bmatrix} 14 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$

Correct Answers:

- A

Problem 4. **(1 point)**
Consider the following linear system:

$$\begin{aligned} -5x_1 + 10x_3 - 8x_4 &= 6 \\ -9x_1 + x_2 + 3x_3 - 8x_4 &= -8 \\ -10x_1 + 8x_2 - 5x_4 &= 7 \\ -x_1 - 10x_2 + 9x_3 + 7x_4 &= -5 \end{aligned}$$

Represent this linear system as a vector equation.

- A. $x_1 \begin{bmatrix} 0 \\ -9 \\ 0 \\ -1 \end{bmatrix} + x_2 \begin{bmatrix} -5 \\ 1 \\ -10 \\ -10 \end{bmatrix} + x_3 \begin{bmatrix} 10 \\ 3 \\ 8 \\ 9 \end{bmatrix} + x_4 \begin{bmatrix} -8 \\ -8 \\ -5 \\ 7 \end{bmatrix} = \begin{bmatrix} 6 \\ -8 \\ 7 \\ -5 \end{bmatrix}$
- B. $x_1 \begin{bmatrix} 0 \\ -5 \\ 10 \\ -8 \end{bmatrix} + x_2 \begin{bmatrix} -9 \\ 1 \\ 3 \\ -8 \end{bmatrix} + x_3 \begin{bmatrix} 0 \\ -10 \\ 8 \\ -5 \end{bmatrix} + x_4 \begin{bmatrix} -1 \\ -10 \\ 9 \\ 7 \end{bmatrix} = \begin{bmatrix} 6 \\ -8 \\ 7 \\ -5 \end{bmatrix}$
- C. $x_1 \begin{bmatrix} -5 \\ -9 \\ -10 \\ -1 \end{bmatrix} + x_2 \begin{bmatrix} 0 \\ 1 \\ 8 \\ -10 \end{bmatrix} + x_3 \begin{bmatrix} 10 \\ 3 \\ 0 \\ 9 \end{bmatrix} + x_4 \begin{bmatrix} -8 \\ -8 \\ -5 \\ 7 \end{bmatrix} = \begin{bmatrix} 6 \\ -8 \\ 7 \\ -5 \end{bmatrix}$
- D. $x_1 \begin{bmatrix} -5 \\ 0 \\ 10 \\ -8 \end{bmatrix} + x_2 \begin{bmatrix} -9 \\ 1 \\ 3 \\ -8 \end{bmatrix} + x_3 \begin{bmatrix} -10 \\ 8 \\ 0 \\ -5 \end{bmatrix} + x_4 \begin{bmatrix} -1 \\ -10 \\ 9 \\ 7 \end{bmatrix} = \begin{bmatrix} 6 \\ -8 \\ 7 \\ -5 \end{bmatrix}$

Correct Answers:

- C

Problem 5. **(1 point)**
Recall that $\mathcal{P}_4$ denotes the set of polynomials of degree at most 4. What is the zero vector in $\mathcal{P}_4$?

- A. x^4
- B. $\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$
- C. There is no zero vector in $\mathcal{P}_4$, the elements of $\mathcal{P}_4$ are not vectors.
- D. 0

Correct Answers:

- D