Problem 1. **(1 point)**

Consider a subspace V of $\mathbb{R}^3$ with a basis $\mathcal{B} = (\vec{v}_1, \vec{v}_2)$, where $\vec{v}_1 = \begin{bmatrix} 2 \\ -2 \\ 3 \end{bmatrix}$ and $\vec{v}_2 = \begin{bmatrix} 4 \\ 4 \\ -1 \end{bmatrix}$. If the $\mathcal{B}$-coordinate vector of a vector $\vec{x}$ is $[\vec{x}]_{\mathcal{B}} = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$, what is $\vec{x}$?

$\vec{x} = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$

Answer(s) submitted:

- $\begin{bmatrix} 2 \\ -10 \\ 10 \end{bmatrix}$

submitted: (correct)
recorded: (correct)

Problem 2. **(1 point)**

Consider the basis $\mathfrak{B}$ of $\mathbb{R}^2$ consisting of the vectors $\vec{v}_1 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $\vec{v}_2 = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$. Find $\begin{bmatrix} -4 \\ -4 \end{bmatrix}_{\mathfrak{B}}$.

Answer: $\begin{bmatrix} -4 \\ -4 \end{bmatrix}_{\mathfrak{B}} = \begin{bmatrix} \_\_ \\ \_\_ \end{bmatrix}$

Answer(s) submitted:

- $\begin{bmatrix} 2 \\ -2 \end{bmatrix}$

submitted: (correct)
recorded: (correct)

Problem 3. **(1 point)**

Let $T(\vec{x}) = A\vec{x}$ be a linear transformation from $\mathbb{R}^3 \to \mathbb{R}^3$, with $A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 4 & -2 \\ 1 & 0 & 2 \end{bmatrix}$. Consider the basis of $\mathbb{R}^3$ given by $\mathfrak{B} = \begin{bmatrix} 3 \\ 3 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ 3 \\ 1 \end{bmatrix}, \begin{bmatrix} 3 \\ 2 \\ 0 \end{bmatrix}$. There are two ways to find B, the $\mathfrak{B}$-matrix of A.

Column-by-column, we can find it by computing $\left[[\vec{w}_1]_{\mathfrak{B}} \quad [\vec{w}_2]_{\mathfrak{B}} \quad [\vec{w}_3]_{\mathfrak{B}} \right]$, where:

$\vec{w}_1 = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$, $\vec{w}_2 = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$, and $\vec{w}_3 = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$.

(Note that the problem asks for the vectors $\vec{w}_1$, $\vec{w}_2$, and $\vec{w}_3$, rather than their $\mathfrak{B}$-coordinates.)

Alternatively, we could find B by writing $S = \begin{bmatrix} \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \end{bmatrix}$,

and then computing

- A. $B = S^{-1}AS$.
- B. $B = AS^{-1}$.
- C. $B = S^{-1}A$.
- D. $B = AS$.
- E. $B = A$.
- F. $B = S^{-1}$

Answer(s) submitted:

- $\begin{bmatrix} 9 \\ 12 \\ 3 \end{bmatrix}$
- $\begin{bmatrix} 9 \\ 10 \\ 5 \end{bmatrix}$
- $\begin{bmatrix} 7 \\ 8 \\ 3 \end{bmatrix}$
- $\begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 2 \\ 0 & 1 & 0 \end{bmatrix}$
- A

submitted: (correct)
recorded: (correct)