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Changing basis

Changing basis

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1. In this quiz, you will practice changing from the standard basis to a basis consisting of orthogonal vectors. **1 / 1 point**

Given vectors $\mathbf{v} = \begin{bmatrix}5\\-1\end{bmatrix}$, $\mathbf{b_1} = \begin{bmatrix}1\\1\end{bmatrix}$ and $\mathbf{b_2} = \begin{bmatrix}1\\-1\end{bmatrix}$ all written in the standard basis, what is $\mathbf{v}$ in the basis defined by $\mathbf{b_1}$ and $\mathbf{b_2}$? You are given that $\mathbf{b_1}$ and $\mathbf{b_2}$ are orthogonal to each other.

- (selected) $\mathbf{v_b} = \begin{bmatrix}2\\3\end{bmatrix}$
- $\mathbf{v_b} = \begin{bmatrix}3\\2\end{bmatrix}$
- $\mathbf{v_b} = \begin{bmatrix}3\\-2\end{bmatrix}$
- $\mathbf{v_b} = \begin{bmatrix}-3\\2\end{bmatrix}$

✓ **Correct**
The vector $\mathbf{v}$ is projected onto the two vectors $\mathbf{b_1}$ and $\mathbf{b_2}$.

2. Given vectors $\mathbf{v} = \begin{bmatrix}10\\-5\end{bmatrix}$, $\mathbf{b_1} = \begin{bmatrix}3\\4\end{bmatrix}$ and $\mathbf{b_2} = \begin{bmatrix}4\\-3\end{bmatrix}$ all written in the standard basis, what is $\mathbf{v}$ in the basis defined by $\mathbf{b_1}$ and $\mathbf{b_2}$? You are given that $\mathbf{b_1}$ and $\mathbf{b_2}$ are orthogonal to each other. **1 / 1 point**

- $\mathbf{v_b} = \begin{bmatrix}11/5\\2/5\end{bmatrix}$
- $\mathbf{v_b} = \begin{bmatrix}-2/5\\11/5\end{bmatrix}$
- (selected) $\mathbf{v_b} = \begin{bmatrix}2/5\\11/5\end{bmatrix}$
- $\mathbf{v_b} = \begin{bmatrix}2\\11\end{bmatrix}$

✓ **Correct**
The vector $\mathbf{v}$ is projected onto the two vectors $\mathbf{b_1}$ and $\mathbf{b_2}$.

3. Given vectors $\mathbf{v} = \begin{bmatrix}2\\2\end{bmatrix}$, $\mathbf{b_1} = \begin{bmatrix}-3\\1\end{bmatrix}$ and $\mathbf{b_2} = \begin{bmatrix}1\\3\end{bmatrix}$ all written in the standard basis, what is $\mathbf{v}$ in the basis defined by $\mathbf{b_1}$ and $\mathbf{b_2}$? You are given that $\mathbf{b_1}$ and $\mathbf{b_2}$ are orthogonal to each other. **1 / 1 point**

- $\mathbf{v_b} = \begin{bmatrix}2/5\\-4/5\end{bmatrix}$
- (selected) $\mathbf{v_b} = \begin{bmatrix}-2/5\\4/5\end{bmatrix}$
- $\mathbf{v_b} = \begin{bmatrix}5/4\\-5/2\end{bmatrix}$
- $\mathbf{v_b} = \begin{bmatrix}-2/5\\5/4\end{bmatrix}$

✓ **Correct**
The vector $\mathbf{v}$ is projected onto the two vectors $\mathbf{b_1}$ and $\mathbf{b_2}$.

4. Given vectors $\mathbf{v} = \begin{bmatrix}1\\1\\1\end{bmatrix}$, $\mathbf{b_1} = \begin{bmatrix}2\\1\\0\end{bmatrix}$, $\mathbf{b_2} = \begin{bmatrix}1\\-2\\-1\end{bmatrix}$ and $\mathbf{b_3} = \begin{bmatrix}-1\\2\\-5\end{bmatrix}$ all written in the standard basis, what is $\mathbf{v}$ in the basis defined by $\mathbf{b_1}$, $\mathbf{b_2}$ and $\mathbf{b_3}$? You are given that $\mathbf{b_1}$, $\mathbf{b_2}$ and $\mathbf{b_3}$ are all pairwise orthogonal to each other. **1 / 1 point**

- $\mathbf{v_b} = \begin{bmatrix}-3/5\\-1/3\\2/15\end{bmatrix}$
- $\mathbf{v_b} = \begin{bmatrix}-3/5\\-1/3\\-2/15\end{bmatrix}$
- (selected) $\mathbf{v_b} = \begin{bmatrix}3/5\\-1/3\\-2/15\end{bmatrix}$