← Back **Changing basis**
Practice Quiz • 15 min • 5 total points

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Grade received 100% To pass 80% or higher

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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.

- ○ $\mathbf{v_b} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$
- ○ $\mathbf{v_b} = \begin{bmatrix} 3 \\ -2 \end{bmatrix}$
- ◉ $\mathbf{v_b} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$
- ○ $\mathbf{v_b} = \begin{bmatrix} -3 \\ 2 \end{bmatrix}$

✓ **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

- ◉ $\mathbf{v_b} = \begin{bmatrix} 2/5 \\ 11/5 \end{bmatrix}$
- ○ $\mathbf{v_b} = \begin{bmatrix} 2 \\ 11 \end{bmatrix}$
- ○ $\mathbf{v_b} = \begin{bmatrix} 11/5 \\ 2/5 \end{bmatrix}$
- ○ $\mathbf{v_b} = \begin{bmatrix} -2/5 \\ 11/5 \end{bmatrix}$

✓ **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

- ○ $\mathbf{v_b} = \begin{bmatrix} 5/4 \\ -5/2 \end{bmatrix}$
- ○ $\mathbf{v_b} = \begin{bmatrix} -2/5 \\ 5/4 \end{bmatrix}$
- ○ $\mathbf{v_b} = \begin{bmatrix} 2/5 \\ -4/5 \end{bmatrix}$
- ◉ $\mathbf{v_b} = \begin{bmatrix} -2/5 \\ 4/5 \end{bmatrix}$

✓ **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

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

- [ ] $\mathbf{v_b} = \begin{bmatrix} -3/5 \\ -1/3 \\ 2/15 \end{bmatrix}$

- [x] $\mathbf{v_b} = \begin{bmatrix} 3/5 \\ -1/3 \\ -2/15 \end{bmatrix}$

Correct
The vector $\mathbf{v}$ is projected onto the vectors $\mathbf{b_1}$, $\mathbf{b_2}$ and $\mathbf{b_3}$.

5. Given vectors $\mathbf{v} = \begin{bmatrix} 1 \\ 1 \\ 2 \\ 3 \end{bmatrix}$, $\mathbf{b_1} = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}$, $\mathbf{b_2} = \begin{bmatrix} 0 \\ 2 \\ -1 \\ 0 \end{bmatrix}$, $\mathbf{b_3} = \begin{bmatrix} 0 \\ 1 \\ 2 \\ 0 \end{bmatrix}$ and $\mathbf{b_4} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 3 \end{bmatrix}$ all written in the standard basis, what is $\mathbf{v}$ in the basis defined by $\mathbf{b_1}, \mathbf{b_2}, \mathbf{b_3}$ and $\mathbf{b_4}$? You are given that $\mathbf{b_1}, \mathbf{b_2}, \mathbf{b_3}$ and $\mathbf{b_4}$ are all pairwise orthogonal to each other.

1 / 1 point

- [ ] $\mathbf{v_b} = \begin{bmatrix} 0 \\ 1 \\ 1 \\ 1 \end{bmatrix}$

- [x] $\mathbf{v_b} = \begin{bmatrix} 1 \\ 0 \\ 1 \\ 1 \end{bmatrix}$

- [ ] $\mathbf{v_b} = \begin{bmatrix} 1 \\ 1 \\ 0 \\ 1 \end{bmatrix}$

- [ ] $\mathbf{v_b} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}$

Correct
The vector $\mathbf{v}$ is projected onto the vectors $\mathbf{b_1}$, $\mathbf{b_2}$, $\mathbf{b_3}$ and $\mathbf{b_4}$.