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Next item →

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.

- ☒  $\mathbf{v}_b = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$
- ☐  $\mathbf{v}_b = \begin{bmatrix} 3 \\ -2 \end{bmatrix}$
- ☐  $\mathbf{v}_b = \begin{bmatrix} -3 \\ 2 \end{bmatrix}$
- ☐  $\mathbf{v}_b = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$

✔ 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

- ☐  $\mathbf{v}_b = \begin{bmatrix} 2 \\ 11 \end{bmatrix}$
- ☒  $\mathbf{v}_b = \begin{bmatrix} 2/5 \\ 11/5 \end{bmatrix}$
- ☐  $\mathbf{v}_b = \begin{bmatrix} -2/5 \\ 11/5 \end{bmatrix}$
- ☐  $\mathbf{v}_b = \begin{bmatrix} 11/5 \\ 2/5 \end{bmatrix}$

✔ 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

- ☐  $\mathbf{v}_b = \begin{bmatrix} 2/5 \\ -4/5 \end{bmatrix}$
- ☐  $\mathbf{v}_b = \begin{bmatrix} -2/5 \\ 5/4 \end{bmatrix}$
- ☐  $\mathbf{v}_b = \begin{bmatrix} 5/4 \\ -5/2 \end{bmatrix}$
- ☒  $\mathbf{v}_b = \begin{bmatrix} -2/5 \\ 4/5 \end{bmatrix}$

✔ 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.

☐  $\mathbf{v}_b = \begin{bmatrix} -3/5 \\ -1/3 \\ 2/15 \end{bmatrix}$

☐  $\mathbf{v}_b = \begin{bmatrix} -3/5 \\ -1/3 \\ -2/15 \end{bmatrix}$

☐  $\mathbf{v}_b = \begin{bmatrix} 3 \\ -1 \\ -2 \end{bmatrix}$

☒  $\mathbf{v}_b = \begin{bmatrix} 3/5 \\ -1/3 \\ -2/15 \end{bmatrix}$

✔ 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.

☐  $\mathbf{v}_b = \begin{bmatrix} 0 \\ 1 \\ 1 \\ 1 \end{bmatrix}$

☒  $\mathbf{v}_b = \begin{bmatrix} 1 \\ 0 \\ 1 \\ 1 \end{bmatrix}$

☐  $\mathbf{v}_b = \begin{bmatrix} 1 \\ 1 \\ 0 \\ 1 \end{bmatrix}$

☐  $\mathbf{v}_b = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}$

✔ Correct

The vector  $\mathbf{v}$  is projected onto the vectors  $\mathbf{b}_1$ ,  $\mathbf{b}_2$ ,  $\mathbf{b}_3$  and  $\mathbf{b}_4$ .