

Congratulations! You passed!

Grade received 100%

To pass 80% or higher

**Go to next
item**

1. For a vector

4 / 4 points

$$\begin{bmatrix} 6 \\ 0 \\ 0 \end{bmatrix}$$

$\mathbf{x} = \begin{bmatrix} 6 \\ 0 \\ 0 \end{bmatrix}$ and the subspace U spanned by the basis vectors $\mathbf{b}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ and $\mathbf{b}_2 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$,

which of the following statements are true?

You can use the formula slide that comes with the corresponding lecture.

☐ The projection of \mathbf{x} onto U is

$$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

☒ The projection matrix is symmetric.



Correct

Projection matrices are always symmetric.

☒ The projection of \mathbf{x} onto U is

$$\begin{bmatrix} 5 \\ 2 \\ -1 \end{bmatrix}$$

$$\begin{bmatrix} 5 \\ 2 \\ -1 \end{bmatrix}$$

☒ **Correct**

Well done.

☐ The projection matrix is not symmetric.

☐ The projection matrix is

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 2 & 4 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 2 & 4 \end{bmatrix}$$

☐ The coordinates of the projected point with respect to $\mathbf{b}_1, \mathbf{b}_2$ are

$$\begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ 0 \end{bmatrix}.$$

☐ The rank of the projection matrix is 1.

☒ The coordinates of the projected point with respect to $\mathbf{b}_1, \mathbf{b}_2$ are

$$\begin{bmatrix} 5 \\ -3 \end{bmatrix}$$

$$\begin{bmatrix} 5 \\ -3 \end{bmatrix}.$$

☒ **Correct**

Excellent job!

☒ The projection matrix is

$$\begin{bmatrix} 5 & 2 & -1 \\ 2 & 2 & 2 \\ -1 & 2 & 5 \end{bmatrix}$$

$$\frac{1}{6} \begin{bmatrix} 5 & 2 & -1 \\ 2 & 2 & 2 \\ -1 & 2 & 5 \end{bmatrix}$$



Correct

Well done!

2. Project

1 / 1 point

$$\begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$$

$\begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$ onto the subspace spanned by $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ and $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$.

You can use the formula slide that comes with the corresponding lecture.



$$\begin{bmatrix} 6 \\ 4 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} 6 \\ 4 \\ 4 \end{bmatrix}$$



$$\begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$$

☐ $\begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}$
 $\begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}$

☒ $\begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$
 $\begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$



Correct

Absolutely! The original vector is already in the subspace, so the projection has no effect.

3. 1. Project

$$\begin{bmatrix} 12 \\ 0 \\ 0 \end{bmatrix}$$

$\begin{bmatrix} 12 \\ 0 \\ 0 \end{bmatrix}$ onto the subspace U_1 spanned by $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$.

2. Project the result from 1. onto the subspace spanned by

$$\begin{bmatrix} -10\sqrt{6} \\ -4\sqrt{6} \\ 2\sqrt{6} \end{bmatrix}$$

$\begin{bmatrix} -10\sqrt{6} \\ -4\sqrt{6} \\ 2\sqrt{6} \end{bmatrix}$. What is the final projection?

1 / 1 point

Hint: For step 2. you do not necessarily need to compute anything.

You can use the formula slide that comes with the corresponding lecture.



$$\begin{bmatrix} 5 \\ 2\sqrt{6} + 1 \\ -\sqrt{6} + 2 \end{bmatrix}$$

$$\begin{bmatrix} 5 \\ 2\sqrt{6} + 1 \\ -\sqrt{6} + 2 \end{bmatrix}$$



$$\begin{bmatrix} 10 \\ 4 \\ -2 \end{bmatrix}$$

$$\begin{bmatrix} 10 \\ 4 \\ -2 \end{bmatrix}$$



$$\begin{bmatrix} 5 \\ 2\sqrt{6} \\ -1\sqrt{6} \end{bmatrix}$$

$$\begin{bmatrix} 5 \\ 2\sqrt{6} \\ -1\sqrt{6} \end{bmatrix}$$

**Correct**

Good job! The first projection already lies in the second subspace. Therefore, the second projection does not do anything.