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.

 \square The projection of **x** onto U is

The projection matrix is symmetric.

✓ Correct

Projection matrices are always symmetric.

The projection of \mathbf{x} onto U is $\begin{bmatrix} 5 \\ 2 \\ -1 \end{bmatrix}$

$\langle \rangle$	Correct
(^/	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 \bm{b}_1 , \bm{b}_2 are $\begin{bmatrix}0\\0\end{bmatrix}$

☐ The rank of the projection matrix is 1.

The coordinates of the projected point with respect to \mathbf{b}_1 , \mathbf{b}_2 are $\begin{bmatrix} 5 \\ -3 \end{bmatrix}$

⊘ Correct

Excellent job!



The projection matrix is

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

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



⊘ Correct

Well done!



1/1 point

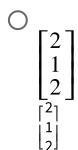
$$\begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$$

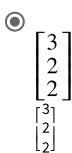
$$\begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$$
 onto the subspace spanned by
$$\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$
 and
$$\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$$
.

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

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

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





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 $\begin{bmatrix}1\\1\end{bmatrix}$, $\begin{bmatrix}0\\1\\2\end{bmatrix}$.

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

Project the result from 1. onto the subspace
$$\begin{bmatrix} -10\sqrt{6} \\ -4\sqrt{6} \\ 2\sqrt{6} \end{bmatrix}$$

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

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

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

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

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

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

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

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

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

✓ Correct

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