Vector operations assessment

5/5 points (100%)

Quiz, 5 questions

✔ **Congratulations! You passed!**

Next Item

✔ 1 / 1 points

1.
In this assessment, you will be tested on all of the different topics you have in covered this module. Good luck!

A ship travels with velocity given by $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$, with current flowing in the direction given by $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ with respect to some co-ordinate axes.

What is the velocity of the ship in the direction of the current?

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

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

Correct
This is the vector projection of the velocity of the ship onto the velocity of the wind.

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

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

✔ 1 / 1 points

2.

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A ball travels with velocity given by $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$, with wind blowing in the

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direction given by $\begin{bmatrix} 3 \\ -4 \end{bmatrix}$ with respect to some co-ordinate axes.

What is the size of the velocity of the ball in the direction of the wind?

○ $\frac{2}{5}$

Correct

This is the scalar projection of the velocity of the ship onto the
velocity of the wind.

○ $-\frac{5}{2}$

○ $\frac{5}{2}$

○ $-\frac{2}{5}$

✔ 1 / 1
points

3.

Given vectors $\mathbf{v} = \begin{bmatrix} -4 \\ -3 \\ 8 \end{bmatrix}$, $\mathbf{b_1} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, $\mathbf{b_2} = \begin{bmatrix} -2 \\ 1 \\ 0 \end{bmatrix}$ and $\mathbf{b_3} = \begin{bmatrix} -3 \\ -6 \\ 5 \end{bmatrix}$

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.

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

Correct

This is a change of basis in 3 dimensions.

○ $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$

○ $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$

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

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✔   **1 / 1 points**

4.

Are the following vectors linearly independent?

$$\mathbf{a} = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} 3 \\ -4 \\ 5 \end{bmatrix} \text{ and } \mathbf{c} = \begin{bmatrix} 1 \\ -8 \\ 7 \end{bmatrix}.$$

○   Yes

⊙   No

Correct
One can be written as a linear combination of the other two.

✔   **1 / 1 points**

5.

At 12:00 pm, a spaceship is at position $\begin{bmatrix} 3 \\ 2 \\ 4 \end{bmatrix}$ km away from the origin with respect to some 3 dimensional co ordinate system. The ship is travelling with velocity $\begin{bmatrix} -1 \\ 2 \\ -3 \end{bmatrix}$ km/h What is the location of the spaceship after 2 hours have passed?

○ $\begin{bmatrix} -1 \\ -6 \\ 2 \end{bmatrix}$

○ $\begin{bmatrix} 2 \\ 4 \\ 1 \end{bmatrix}$

⊙ $\begin{bmatrix} 1 \\ 6 \\ -2 \end{bmatrix}$

Correct

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This takes the idea of vectors in the context of a moving body.

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$$\bigcirc \quad \begin{bmatrix} -2 \\ 4 \\ -1 \end{bmatrix}$$