Congratulations! You passed!

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

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?

- $\begin{bmatrix}3/2\\2/3\end{bmatrix}$
- (selected) $\begin{bmatrix}3/2\\3/2\end{bmatrix}$
- $\begin{bmatrix}2/3\\2/3\end{bmatrix}$
- $\begin{bmatrix}2/3\\3/2\end{bmatrix}$

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

2. A ball travels with velocity given by $\begin{bmatrix}2\\1\end{bmatrix}$, with wind blowing in the direction given by $\begin{bmatrix}3\\-4\end{bmatrix}$ with respect to some co-ordinate axes. **1 / 1 point**

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

- $\frac{5}{2}$
- (selected) $\frac{2}{5}$
- $-\frac{2}{5}$
- $-\frac{5}{2}$

Correct
This is the scalar projection of the velocity of the ball onto the velocity of the wind.

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. **1 / 1 point**

- (selected) $\begin{bmatrix}1\\1\\1\end{bmatrix}$
- $\begin{bmatrix}0\\1\\1\end{bmatrix}$
- $\begin{bmatrix}1\\0\\1\end{bmatrix}$
- $\begin{bmatrix}1\\1\\0\end{bmatrix}$

Correct
This is a change of basis in 3 dimensions.

4. Are the following vectors linearly independent? **1 / 1 point**

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

- Yes

- [x] No

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

5. 1 / 1 point

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?

- [ ] $\begin{bmatrix} -2 \\ 4 \\ -1 \end{bmatrix}$
- [ ] $\begin{bmatrix} 2 \\ 4 \\ 1 \end{bmatrix}$
- [x] $\begin{bmatrix} 1 \\ 6 \\ -2 \end{bmatrix}$
- [ ] $\begin{bmatrix} -1 \\ -6 \\ 2 \end{bmatrix}$

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