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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?

- ☐  $\begin{bmatrix} 3/2 \\ 2/3 \end{bmatrix}$
- ☒  $\begin{bmatrix} 3/2 \\ 3/2 \end{bmatrix}$
- ☐  $\begin{bmatrix} 2/3 \\ 2/3 \end{bmatrix}$
- ☐  $\begin{bmatrix} 2/3 \\ 3/2 \end{bmatrix}$

✔ 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?

- ☐  $\frac{5}{2}$
- ☒  $\frac{2}{5\sqrt{2}}$
- ☐  $-\frac{2}{5\sqrt{2}}$
- ☐  $-\frac{5}{2}$

✔ 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

- ☒  $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$
- ☐  $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$
- ☐  $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$
- ☐  $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$

✔ 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
- ☒ No

✔ Correct

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

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?

1 / 1 point

- ☐  $\begin{bmatrix} 2 \\ 4 \\ 1 \end{bmatrix}$
- ☐  $\begin{bmatrix} -2 \\ 4 \\ -1 \end{bmatrix}$
- ☒  $\begin{bmatrix} 1 \\ 6 \\ -2 \end{bmatrix}$
- ☐  $\begin{bmatrix} -1 \\ -6 \\ 2 \end{bmatrix}$

✔ Correct

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