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1. Vectors practice

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Practice

1.

2/2 points (graded)

You wish to throw a paper airplane so that it flies due north with a speed of 25 meters per second (as seen from the ground). The wind is blowing in from the northeast at 10 meters per second.

Give a velocity vector whose length is the speed you should throw it and whose direction will give the desired trajectory.

(Enter the $\hat{i}$ and $\hat{j}$-components, where $\hat{i}$ points east and $\hat{j}$ points north.)

10/sqrt(2) $\hat{i}$ + ✔ 10/sqrt(2)+25 $\hat{j}$ ✔

Answer: 10/sqrt(2)

Answer: 25+10/sqrt(2)

Solution:

If you throw an airplane with velocity $\vec{v}$, and the wind is also blowing it at velocity $\vec{w}$, then the airplane will move with velocity $\vec{v}+\vec{w}$.

In this problem, we are given that $\vec{v}+\vec{w}=\langle 0,25\rangle \mathbf{m/s}$. We are given the magnitude and direction of $\vec{w}$

- the magnitude is $|\vec{w}|=10\mathbf{m/s}$, and
- the direction is coming towards the origin from the northeast, which means $\vec{w}$ is parallel to the direction $\langle -1,-1\rangle$.

Therefore $\vec{w}=c\langle -1,-1\rangle$ and $c\sqrt{2}=10$, which tells us that $c=10/\sqrt{2}$. Thus $\vec{w}=\langle -10/\sqrt{2},-10/\sqrt{2}\rangle$.

Solving for each component of $\vec{v}=\langle v_1,v_2\rangle$ we get

$$v_1+w_1 = 0 \quad (3.64)$$
$$v_1-10/\sqrt{2} = 0 \quad (3.65)$$
$$v_1=10/\sqrt{2} \quad (3.66)$$

and

$$v_2+w_2 = 25 \quad (3.67)$$
$$v_2-10/\sqrt{2} = 25 \quad (3.68)$$
$$v_2=25+10/\sqrt{2} \quad (3.69)$$

Submit You have used 1 of 15 attempts

Answers are displayed within the problem

2.

2/2 points (graded)

What are the $\hat{i}$ and $\hat{j}$ components of a two-dimensional vector $\vec{A}$ of length 3, if it mak 6 and $\pi/3$ with $\hat{i}$

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and $\pi/3$ with $\hat{j}$.

3*sqrt(3)/2 $\hat{i}$ + ✔ 3/2 $\hat{j}$ ✔

Answer: 3*sqrt(3)/2 **Answer:** 1.5

Solution:

The condition that $\vec{A}$ makes an angle of $\pi/6$ with $\hat{i}$ and $\pi/3$ with $\hat{j}$ tells us that $\vec{A}$ lies in the first quadrant.

The direction can be written as $\langle \cos(\pi/6), \sin(\pi/6) \rangle$ and the length is 3, thus the vector is

$$\vec{A} = 3\langle \cos(\pi/6), \sin(\pi/6) \rangle = \langle 3\sqrt{3}/2, 3/2 \rangle.$$

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Answers are displayed within the problem

1. Vectors practice

Topic: Unit 2: Geometry of Derivatives / 1. Vectors practice

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- What is Issue — 6
  The NE vector is 45 degrees so has a sin and cos of sqrt(2) /2. Multiply by 10 to get 5*sqrt(2) and then subtract this from <0, 25> ve...
- [Staff] Concern about Exercise 1. Vectors practice — 2
  While this is not a physics course and this exercise is intended to let students practise vector addition, I thought I should point out th...
- [Staff] Question 1: Missing Information — 2
- [Typo] hats — 2
  Community TA
- Q2: different angles — 3
  For Q2, why does the 2D Vector have different angles with the i and j components? I thought the angle is normally the same!
- Direction cosines (re: part 2) — 1
  For part 2, it may be useful to note that for any vector, its component along an axis is the magnitude of the vector times the cosine o...

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