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7. Changing perspective on magnitude and direction

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Lecture due Aug 18, 2021 20:30 IST Completed

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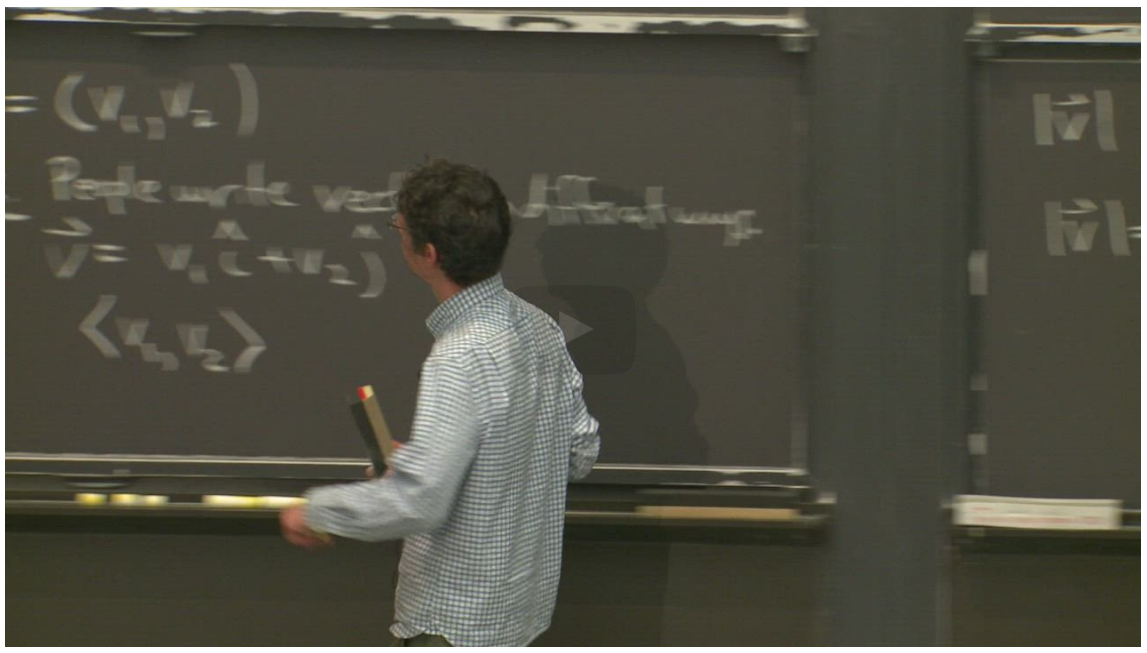

0:00 / 0:00 2.0x

Start of transcript. Skip to the end.

PROFESSOR: Let me pause and ask you all the question.

On the board that we just erased,

it said that a vector is something that has

a magnitude and a direction.

So if we can describe its magnitude

and we can describe its direction,

we should be able to figure out what vector it is.

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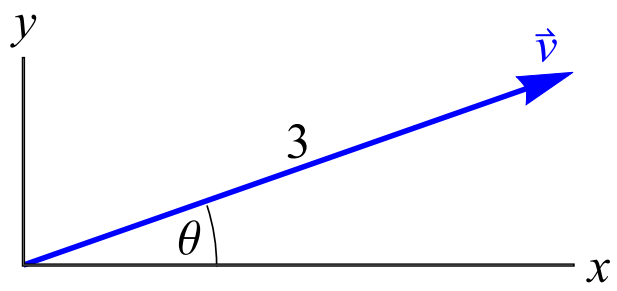
Changing perspective on magnitude and direction

1/1 point (graded)



Find the vector $\vec{v}$ in terms of θ.

- $\vec{v} = \langle \sin\theta, \cos\theta \rangle$
- $\vec{v} = \langle \cos\theta, \sin\theta \rangle$
- $\vec{v} = \langle 3\sin\theta, 3\cos\theta \rangle$
- ✔ $\vec{v} = \langle 3\cos\theta, 3\sin\theta \rangle$

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Solution:

The x-component of the vector is $3\cos\theta$. The y-component is $3\sin\theta$. Therefore the answer is that $\vec{v} = \langle 3\cos\theta, 3\sin\theta\rangle$.

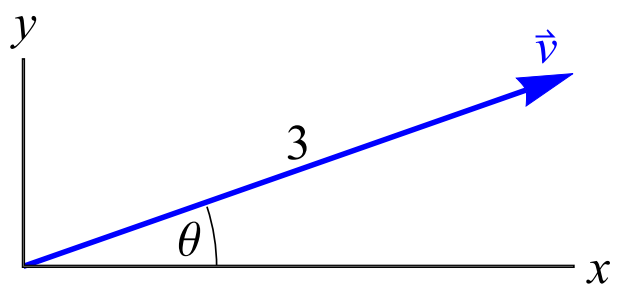
Submit You have used 1 of 2 attempts

Answers are displayed within the problem

Direction vectors

2.0/2 points (graded)

Find the unit vector that points in the same direction as $\vec{v}$, where $\vec{v}$ is the vector of length 3 that makes an angle θ above the horizontal axis.



(Enter the vector as **[a,b]** for the vector $\langle a, b\rangle$. Type **theta** for θ.)

[cos(theta), sin(theta)] ✔ **Answer:** [cos(theta),sin(theta)]

Determine the angle θ in terms of the vector components $\vec{v} = \langle v_1, v_2\rangle$.

(Enter your answer in terms of v_1 and v_2. Type **v_1** for v_1.)

$\theta =$ arctan(v_2/v_1) ✔ **Answer:** arctan(v_2/v_1)

$\arctan\left(\frac{v_2}{v_1}\right)$

? INPUT HELP

Solution:

The vector $\vec{v} = \langle 3\cos(\theta), 3\sin(\theta)\rangle$. This is a vector of length 3.

The vector with unit length pointing in the same direction as $\vec{v}$ is

$$\hat{v} = \frac{1}{3}\langle 3\cos(\theta), 3\sin(\theta)\rangle = \langle \cos(\theta), \sin(\theta)\rangle.$$

Observe that to determine the angle θ, we can use the fact that

$$\frac{\sin\theta}{\cos\theta} = \frac{v_2}{v_1},$$

thus solving for θ we get

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$$\arctan\left(\frac{v_2}{v_1}\right) = \theta.$$

Submit You have used 1 of 15 attempts

Answers are displayed within the problem

Take away

Note that we can determine the angle of any unit vector $\hat{\boldsymbol{w}}$ as we did in the previous problem, but it is not particularly useful. Instead, we use the unit vector itself as the indication of the direction.

Definition 7.1

The vector $\vec{v}$ has **magnitude** $|\vec{v}|$ and **direction** $\hat{v}$.

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Topic: Unit 2: Geometry of Derivatives / 7. Changing perspective on magnitude and direction

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- [staff] Formula help button for the last question — 4
  Hello, I think it would be beneficial for the learners to have a "formula help" button for the last question, so we can quickly get to the ...
- I don't really understand what answer is expected in "Direction vectors" — 5
  I tried some answers that I think should be correct, theoretically, but the grading system doesn't accept the answer. One reason: Inv...
- [Staff] Typo — 2
- [Lecture 4-7] Direction Vectors — 3
  Community TA
- Can someone explain the first question "Find the unit vector that points..."? — 3
  I've been trying to look at it similar to previous unit vector, but im getting the answer completely wrong.

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