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4. Magnitude

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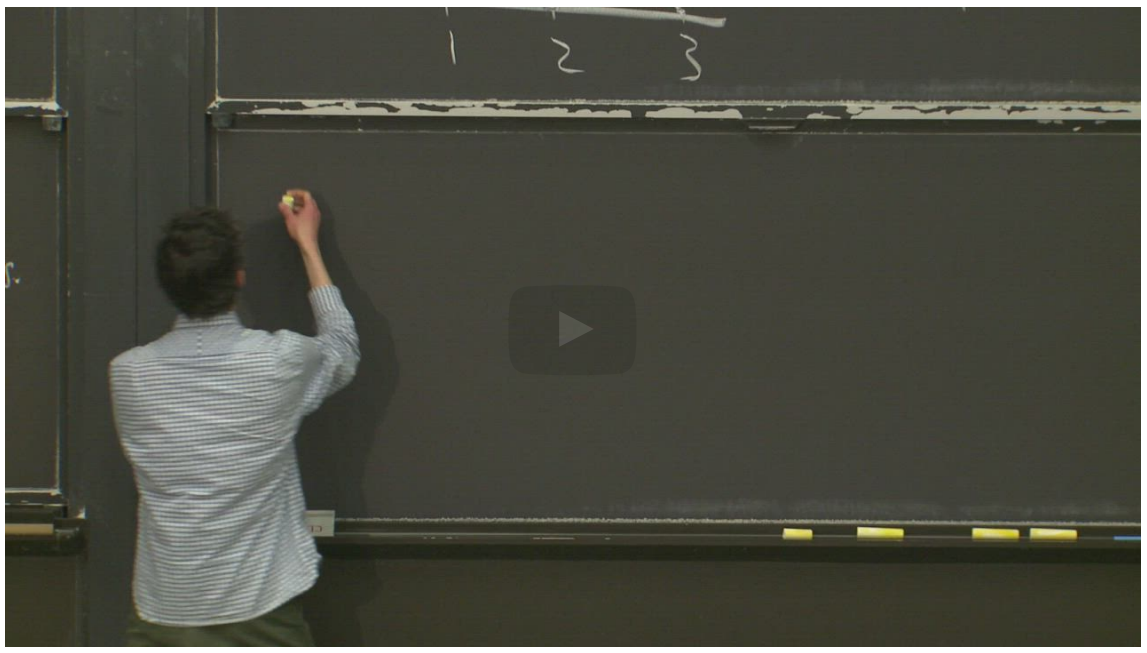
Lecture due Aug 18, 2021 20:30 IST Completed

Practice

Vector magnitude



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Start of transcript. Skip to the end.

PROFESSOR: Speaking of magnitude, or length,

we write it this way.

The norm of the vector, the absolute value of a vector,

this means the length of the vector,

also called the magnitude.

And in terms of v1 and v2, we can find it from the picture

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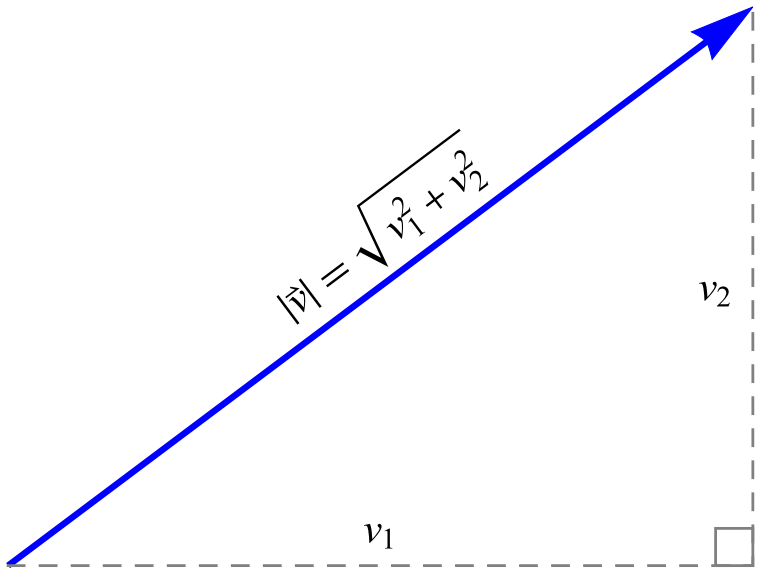
Definition 4.1 The **magnitude** of a vector $\vec{v}$ is equal to its length and is denoted by $|\vec{v}|$.

We can find the magnitude of the vector $\vec{v} = \langle v_1, v_2 \rangle$ by using the Pythagorean theorem. We draw a triangle with base v_1, height v_2, and hypotenuse $|v|$. Then the magnitude of the vector $\vec{v} = \langle v_1, v_2 \rangle$ is given by

$$|\vec{v}| = \sqrt{v_1^2 + v_2^2}. \tag{3.3}$$

The image below illustrates this idea.



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Spoiler: Magnitude in higher dimensions

Consider a vector with n components given by $\vec{v} = \langle v_1, v_2, \ldots, v_n \rangle$. The magnitude of $\vec{v}$ is given by

$$|\vec{v}| = \sqrt{v_1^2 + v_2^2 + \cdots + v_n^2}. \tag{3.4}$$

Hide

A note about terminology: In some videos, the professor uses the word “norm" when referring to the magnitude. This is because the magnitude of a vector is given by what is called the Euclidean norm. There are many different kinds of norms used to measure different mathematical objects such as numbers, vectors, and functions.

Vector magnitude practice 1

3/3 points (graded)
Find the magnitude of the following vectors.

(Note you may enter math expressions or numbers. You need only enter decimals to 2 decimal places.)

$\vec{v} = \langle 3, 4 \rangle$, $|\vec{v}| =$ 5 ✔ **Answer:** 5

$\vec{w} = \langle -2, 0 \rangle$, $|\vec{w}| =$ 2 ✔ **Answer:** 2

$\vec{u} = \langle -1, 1, -10 \rangle$, $|\vec{u}| =$ sqrt(102) ✔ **Answer:** sqrt(102)

Solution:

From the definition of magnitude, we have

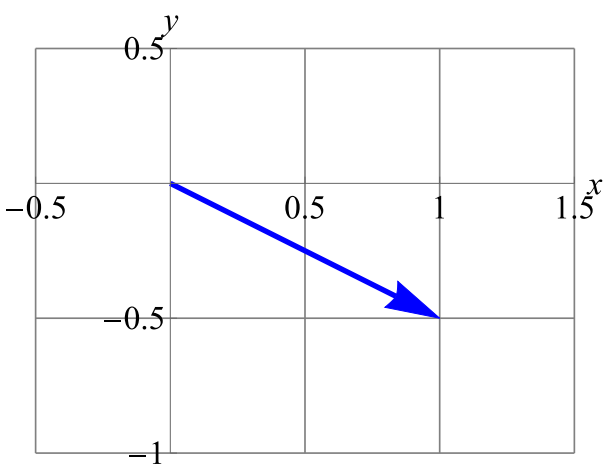
$$\begin{aligned} |\vec{v}| &= |\langle 3, 4 \rangle| = \sqrt{3^2 + 4^2} = \sqrt{25} = 5 \\ |\vec{w}| &= |\langle -2, 0 \rangle| = \sqrt{(-2)^2 + 0^2} = \sqrt{4} = 2 \\ |\vec{u}| &= |\langle -1, 1, -10 \rangle| = \sqrt{(-1)^2 + (1)^2 + (-10)^2} = \sqrt{102}. \end{aligned}$$

Submit You have used 1 of 5 attempts

Answers are displayed within the problem

Vector magnitude practice 2

1/1 point (graded)
Find the magnitude of the vector drawn below.



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(Note you may enter math expressions or numbers. You need only enter decimals to 2 decimal places.)

$|\vec{v}| =$ 1.118034 ✔ **Answer:** sqrt(1.25)

Solution:

The vector plotted is given by $\vec{v} = \langle 1, -0.5 \rangle$. The magnitude is therefore

$$|\vec{v}| = |\langle 1, -0.5 \rangle| = \sqrt{1^2 + 0.5^2} = \sqrt{1.25}. \tag{3.5}$$

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ℹ Answers are displayed within the problem

4. Magnitude

Topic: Unit 2: Geometry of Derivatives / 4. Magnitude

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tick marks on line above not working 7
Although I correctly answered the questions in this particular section, the tick marks for these exercises are not showing on the top l...

Why does the pythagorean theorem work beyond two dimensions? 4
Could someone provide some insights on this matter? Thanks in advance!

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