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Previous Next

2. Vector addition

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Problem Set A due Aug 18, 2021 20:30 IST Completed

2A-4

3.0/3 points (graded)

What is the vector $\vec{v}$ that starts at the point $(1,0)$ and ends at $(2,2)$?

(Enter the vector in the form `[a,b]`. That is surround your vector by square brackets, and separate entries by a comma. Note that the entries of your vector must be numbers.)

$\vec{v} =$ [1,2] ✔ **Answer:** [1,2]

Imagine the line segment from $(1,0)$ to $(2,2)$. Suppose we start at $(1,0)$ and follow this line segment one third of the way to $(2,2)$. What point do we end up at?

(Enter the ordered pair in round parentheses, e.g. `(x, y)`.)

(4/3,2/3) ✔ **Answer:** (4/3,2/3)

Imagine the line segment from $(1,0)$ to $(2,2)$. Suppose we start at $(1,0)$ and go a distance of 0.5 along this line segment. What point do we end up at?

(Enter the ordered pair in parentheses, e.g. `(x, y)`.)

(1+1/(2*sqrt(5)),1/sqrt(5)) ✔ **Answer:** (1+1/(2*sqrt(5)),1/sqrt(5))

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Solution:

The vector from a point (x_1, y_1) to a point (x_2, y_2) is given by subtracting the coordinates of the beginning point from the coordinates of the endpoint. In this case, we have

$$\vec{v} = \langle 2,2\rangle - \langle 1,0\rangle = \langle 1,2\rangle.$$

The vector $\vec{v}$ above is the vector from $(1,0)$ to $(2,2)$. So to go a third of the way from $(1,0)$ to $(2,2)$, we should add $\frac{1}{3}\vec{v}$ to $\langle 1,0\rangle$. So the point we end up at is

$$(1,0) + \left(\frac{1}{3}, \frac{2}{3}\right) = \left(\frac{4}{3}, \frac{2}{3}\right).$$

To go a distance of 0.5 along the line segment from $(1,0)$ to $(2,2)$, we add a vector $\vec{w}$ to $\langle 1,0\rangle$ where $\vec{w}$ is in the same direction as $\vec{v}$ and has length 0.5. The unit vector in the direction of $\vec{v}$ is $\langle 1/\sqrt{5}, 2/\sqrt{5}\rangle$. So $\vec{w}$ is given by

$$\vec{w} = \frac{1}{2}\langle 1/\sqrt{5}, 2/\sqrt{5}\rangle = \langle \frac{1}{2\sqrt{5}}, \frac{1}{\sqrt{5}}\rangle.$$

Adding this to $\langle 1,0\rangle$ means we end up at the point

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$$(1,0)+\left(\frac{1}{2\sqrt{5}},\frac{1}{\sqrt{5}}\right)=\left(1+\frac{1}{2\sqrt{5}},\frac{1}{\sqrt{5}}\right).$$

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Answers are displayed within the problem

2. Vector addition

Topic: Unit 2: Geometry of Derivatives / 2. Vector addition

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Previous Next

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