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4. Vector components

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Calculator

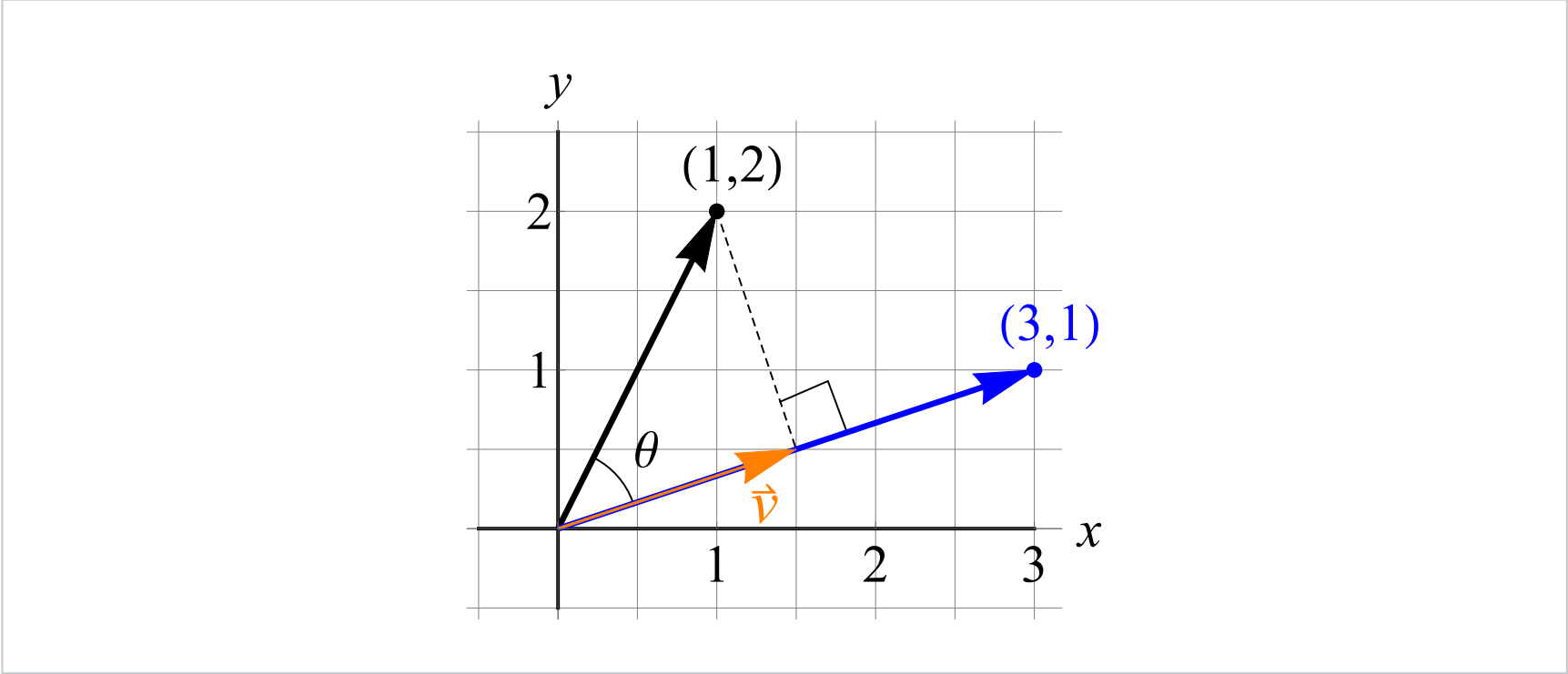


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Problem Set A due Aug 18, 2021 20:30 IST Completed

2A-6(a)

1/1 point (graded)
Consider the figure below.



Find the cosine of the angle θ shown above.

$\cos \theta =$ ✔ Answer: 1/sqrt(2)

? INPUT HELP

Solution:

Taking the dot product of the vector $\langle 1, 2 \rangle$ and $\langle 3, 1 \rangle$ gives

$$\langle 1, 2 \rangle \cdot \langle 3, 1 \rangle = 5.$$

We also have

$$\langle 1, 2 \rangle \cdot \langle 3, 1 \rangle = |\langle 1, 2 \rangle| |\langle 3, 1 \rangle| \cos \theta = \sqrt{50} \cos \theta.$$

Setting the above equations equal to each other gives

$$5 = \sqrt{50} \cos \theta$$

which implies

$$\cos \theta = \frac{5}{\sqrt{50}} = \frac{1}{\sqrt{2}}.$$

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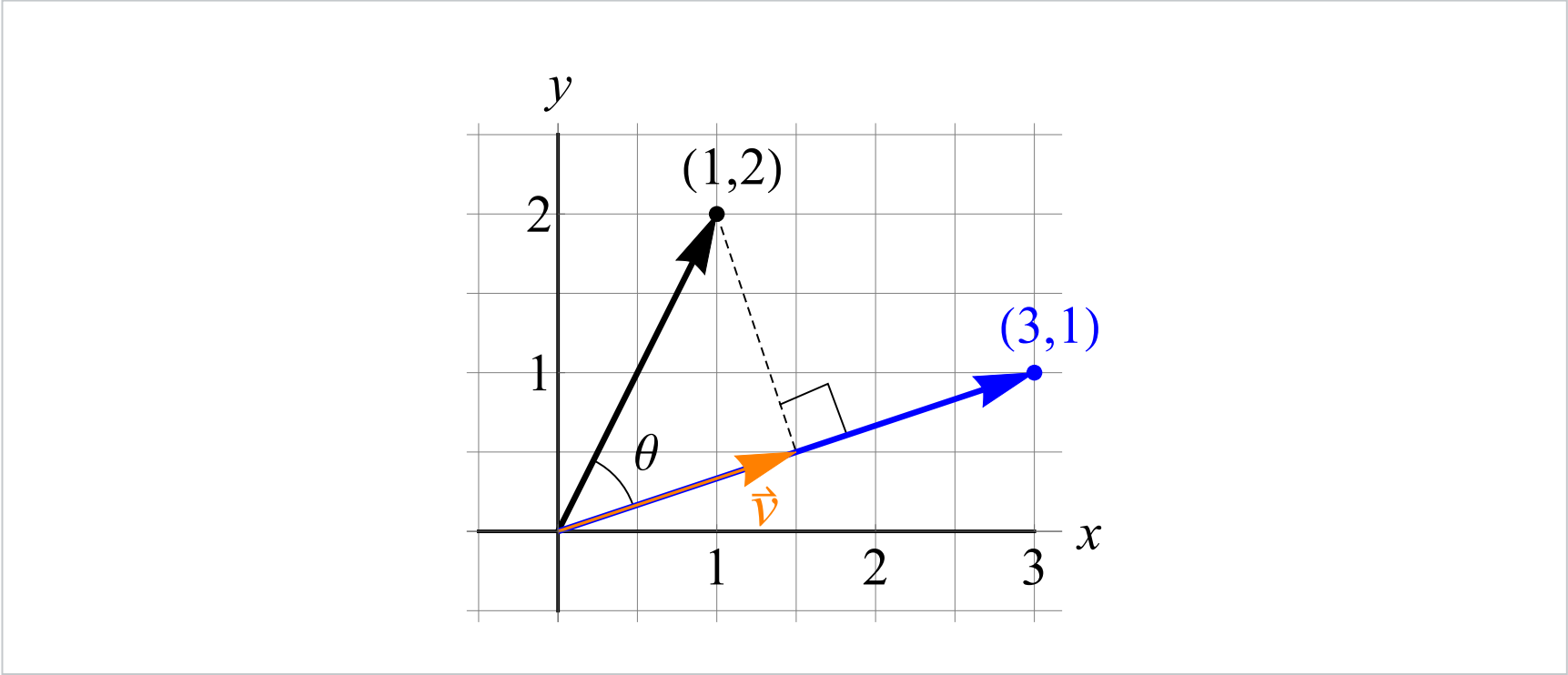
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i Answers are displayed within the problem

2A-6(b)

1/1 point (graded)

Use your answer from the previous question to find the length of the vector \vec{v} shown.

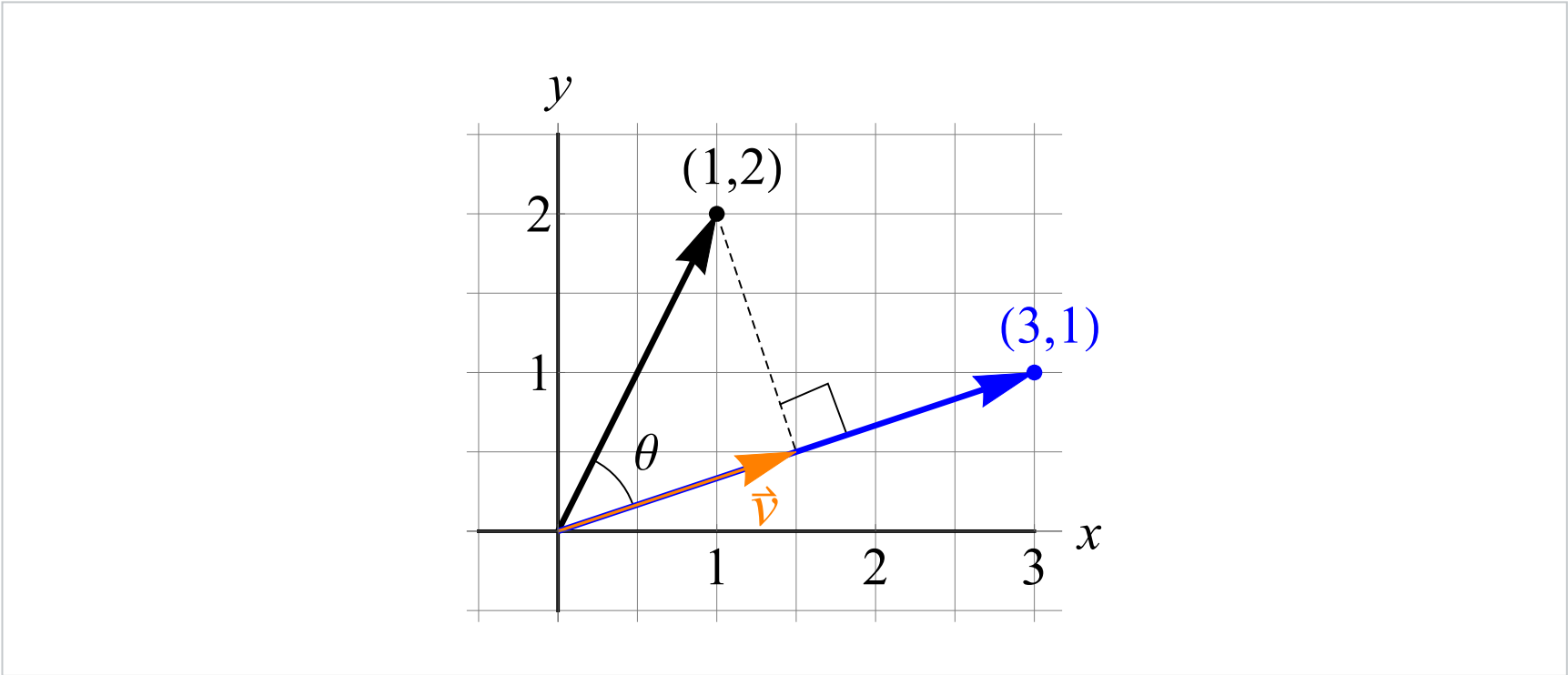


$|\vec{v}| =$ **✓ Answer:** sqrt(5/2)

? INPUT HELP

Solution:

Consider the right triangle in the figure below whose hypotenuse is the vector $\langle 1, 2 \rangle$.



The hypotenuse has length $\sqrt{5}$. By definition, we have $|\vec{v}| = |\langle 1, 2 \rangle| \cos \theta$. Using the value of $\cos \theta$ computed above, we have

$$|\vec{v}| = |\langle 1, 2 \rangle| \cos \theta = \sqrt{5} \cos \theta = (\sqrt{5}) \left(\frac{1}{\sqrt{2}} \right) = \frac{\sqrt{5}}{\sqrt{2}} = \sqrt{5/2}.$$

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You have used 1 of 9 attempts

i Answers are displayed within the problem

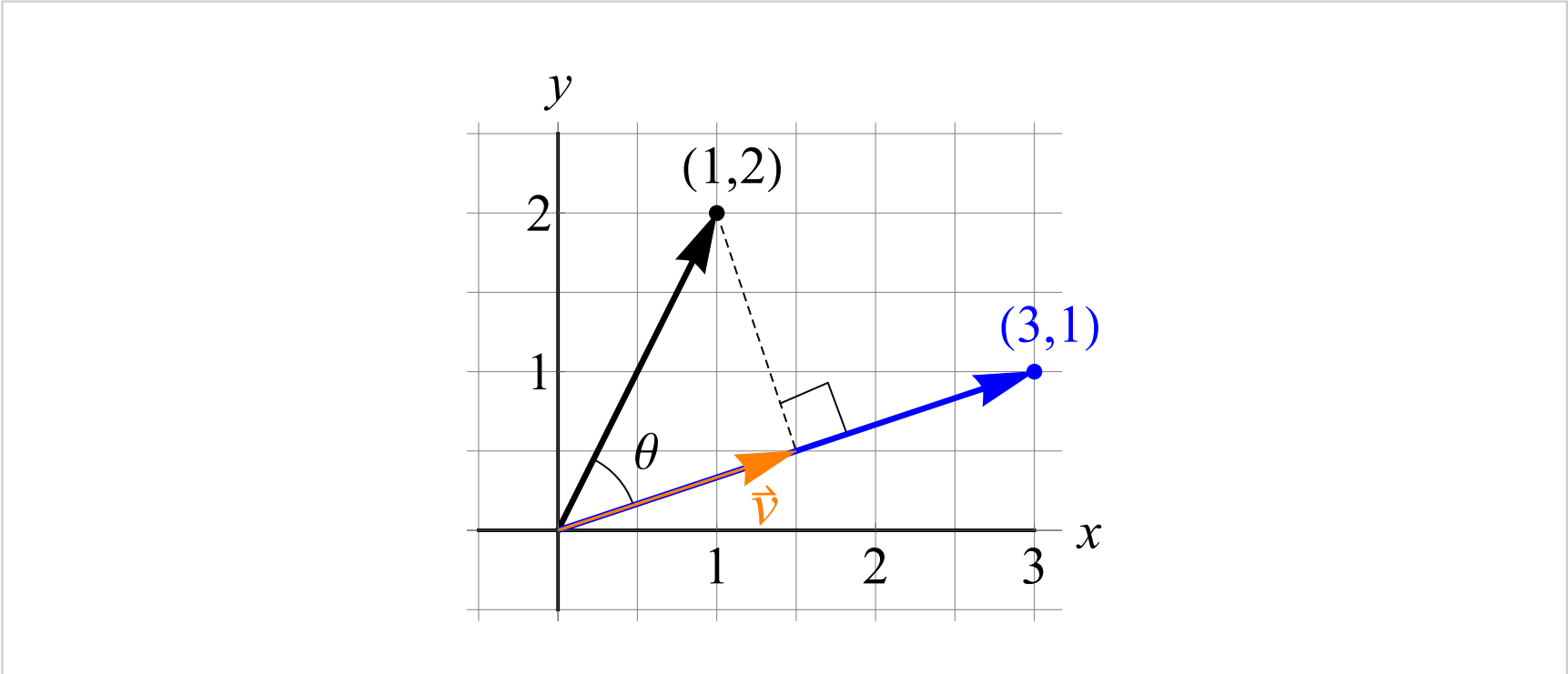
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2A-6(c)

1.0/1 point (graded)

Find the components of the vector \vec{v} shown in orange.



(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.)

$\vec{v} =$

✔ Answer: [3/2,1/2]

Solution:

The vector \vec{v} is in the same direction as $\langle 3, 1 \rangle$, and we know $|\vec{v}| = \sqrt{10}/2$. The unit vector in the direction of $\langle 3, 1 \rangle$ is $\langle 3/\sqrt{10}, 1/\sqrt{10} \rangle$. So \vec{v} is given by

$$\vec{v} = |\vec{v}| \langle \frac{3}{\sqrt{10}}, \frac{1}{\sqrt{10}} \rangle = \langle \frac{3}{2}, \frac{1}{2} \rangle.$$

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You have used 1 of 9 attempts

Answers are displayed within the problem

4. Vector components

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Topic: Unit 2: Geometry of Derivatives / 4. Vector components

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Geometric Approach to 2A-6(a).	1
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