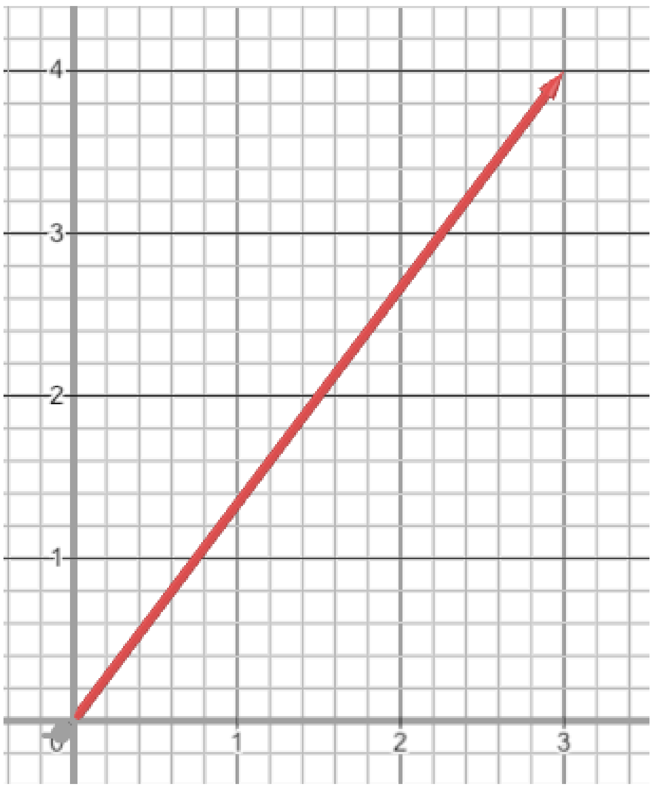
Precalculus 6.2 Key Points

Vectors:
A vector is a quantity that has magnitude and direction.

Vectors can be written in component form, such as $\langle 3, 4\rangle$, or by using unit vectors, such as $3\hat{\imath} + 4\hat{\jmath}$ (Read as "3 i-hat plus 4 j-hat). Both of these describe a vector that has a magnitude of 5 (which can be found using the Pythagorean Theorem) and a direction of approximately $53.13°$ or $0.927\ radians$



Vector Addition:
To add two vectors together, add their components together.

If $\vec{u} = \langle -1, 4\rangle$ and $\vec{v} = \langle 6, -3\rangle$,
then $\vec{u} + \vec{v} = \langle -1 + 6, 4 - 3\rangle = \langle 5, 1\rangle$

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Vector Multiplication:
To find the product of a vector with a scalar, multiply the scalar by each vector component
If $\vec{u} = \langle 1, 2\rangle$, then $3\vec{u} = \langle 3, 6\rangle$

To find the dot product of two vectors, multiply their corresponding components and add the results together

If $\vec{u} = \langle 2, 5\rangle$ and $\vec{v} = \langle 3, -4\rangle$,
then $\vec{u} \bullet \vec{v} = (2 \bullet 3) + (5 \bullet -4) = 6 - 20 = -14$

The dot product can also be written as $||u||\ ||v|| cos(\theta)$, where $||u||$ and $||v||$ are the magnitudes of two vectors and θ is the angle between them

To find the cross product of two vectors, multiply the first component of the first vector by the second component of the second vector and subtract from that the result of multiplying the second component of the first vector by the first component of the second vector.

If $\vec{u} = \langle 8, 2\rangle$ and $\vec{v} = \langle 3, 5\rangle$,
then $\vec{u} \times \vec{v} = (8 \bullet 5) - (2 \bullet 3) = 40 - 6 = 24$

The cross product can also be written as $||u||\ ||v|| sin(\theta)$, where $||u||$ and $||v||$ are the magnitudes of two vectors and θ is the angle between them