

Vectors (6.6)

Vectors

Vectors are quantities that involve both a magnitude and direction.

A magnitude is the distance of the vector denoted by $\|v\|$.

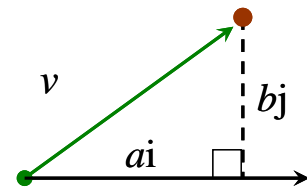
The direction has a slope m .

A scalar has a magnitude but not direction.

$$\|v\| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Terminal Point: $P_2 = (x_2, y_2)$

$$m_v = \frac{y_2 - y_1}{x_2 - x_1}$$

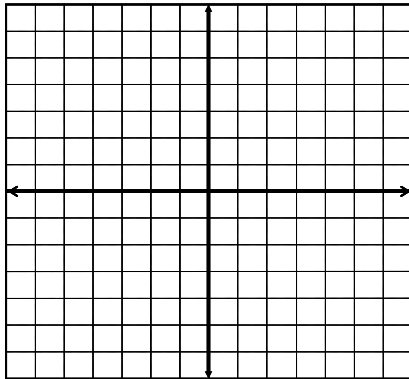


Initial Point: $P_1 = (x_1, y_1)$

Representing a Vector in Rectangular Coordinates and Finding Its Magnitude: Sketch each vector as a position vector and find its magnitude.

1. $v = -i - 3j$

2. $u = 5i - j$



Representing a Vector in Rectangular Coordinates

Given initial point $P_1 = (x_1, y_1)$ and terminal point $P_2 = (x_2, y_2)$

$$v = (x_2 - x_1)\mathbf{i} + (y_2 - y_1)\mathbf{j}$$

Representing a Vector in Rectangular Coordinates: Let v be the vector from initial point P_1 to terminal point P_2 . Write v in terms of \mathbf{i} and \mathbf{j} .

3. $P_1 = (-7, -4), P_2 = (0, -2)$

4. $P_1 = (4, -5), P_2 = (4, 3)$

Adding and Subtracting Vectors in Terms of i and j

$$v + w = (a_1 + a_2)i + (b_1 + b_2)j$$

$$v - w = (a_1 - a_2)i + (b_1 - b_2)j$$

Scalar Multiplication with a Vector in Terms of i and j

$$kv = (ka)i + (kb)j$$

Operations with Vectors in Terms of i and j: Find each specified vector or scalar given:

$$u = 3i - 2j, v = -i + 3j, w = -4i - j$$

5. $v - w$

6. $3u + 2v$

7. $\|-2u\|$

8. $\|w - u\|$

Writing a Vector in Terms of Its Magnitude and Direction

$$v = \|v\| \cos \theta i + \|v\| \sin \theta j$$

Writing a Vector in Terms of Its Magnitude and Direction: Write the vector v in terms of i and j whose magnitude and direction angle are given.

9. $\|v\| = 8, \theta = 45^\circ$

10. The magnitude and direction exerted by two tugboats towing a ship are 4200 pounds , N65°E, and 3000 pounds, S58°E, respectively. Find the magnitude, to the nearest pound and the direction angle, to the nearest tenth of a degree, of the resultant force.