Section 8.4 Continued

$\|v\|$ represents the magnitude of v

Properties: a) $\|v\| \geq 0$

b) $\|v\| = 0$ if and only if $v = 0$

c) $\|-v\| = \|v\|$

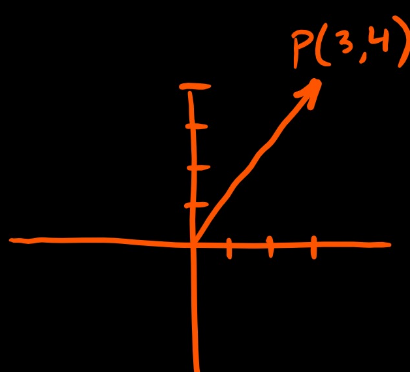
d) $\|\alpha v\| = |\alpha| \cdot \|v\|$

A vector u for which $\|u\| = 1$ is called a unit vector.

We can represent vectors algebraically by breaking them down into components.

$v = \langle a, b \rangle$ a and b are real numbers and are the components of v.

ex: $v = \langle 3, 4 \rangle$



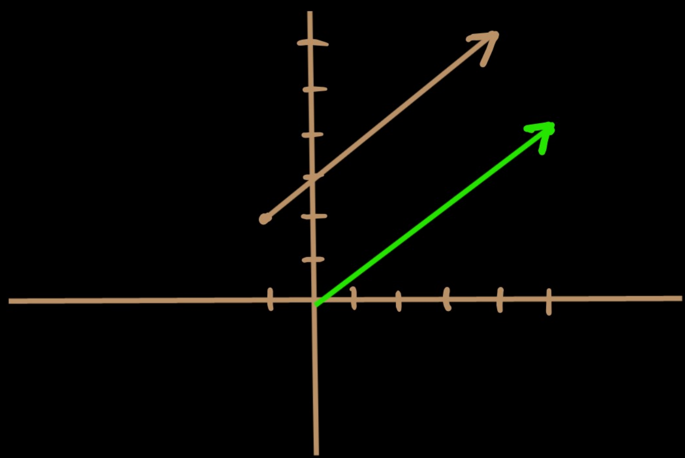
$\langle 3, 4 \rangle$ is a position vector.

Any vector whose initial point is not the origin is equal to a position vector (starts at origin).

Suppose v is a vector with initial point $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$

The position vector $v = \langle x_2 - x_1, y_2 - y_1 \rangle$

Suppose $P_1 = (\overset{x_1, y_1}{-1, 2})$ and $P_2 = (\overset{x_2, y_2}{4, 6})$, find the position vector.



$$v = \langle 4-(-1), 6-2 \rangle$$

$$= \langle 5, 4 \rangle$$

We can also write any algebraic vector as $a\mathbf{i} + b\mathbf{j}$ where $\mathbf{i} = \langle 1, 0 \rangle$ and $\mathbf{j} = \langle 0, 1 \rangle$

Let $v = a_1\mathbf{i} + b_1\mathbf{j}$ and $w = a_2\mathbf{i} + b_2\mathbf{j}$ and α is a scalar

$$v + w = (a_1 + a_2)\mathbf{i} + (b_1 + b_2)\mathbf{j} = \langle a_1 + a_2, b_1 + b_2 \rangle$$

$$v - w = (a_1 - a_2)\mathbf{i} + (b_1 - b_2)\mathbf{j} = \langle a_1 - a_2, b_1 - b_2 \rangle$$

$$\alpha v = (\alpha a_1)\mathbf{i} + (\alpha b_1)\mathbf{j} = \langle \alpha a_1, \alpha b_1 \rangle$$

$$\|v\| = \sqrt{a_1^2 + b_1^2}$$

ex 3 p624 If $v = 2i + 3j = \langle 2,3 \rangle$

$w = 3i - 4j = \langle 3,-4 \rangle$

a) $v + w = 2i + 3j + 3i - 4j = 5i - j = \langle 5,-1 \rangle$

b) $v - w = (2i + 3j) - (3i - 4j) = 2i + 3j - 3i + 4j$

$= -i + 7j = \langle -1, 7 \rangle$

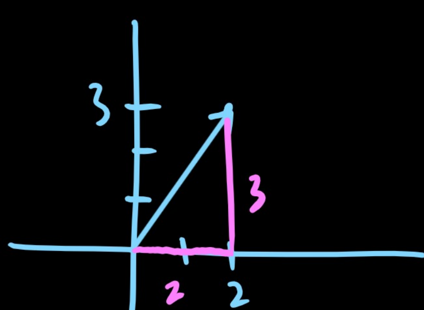
c) $3v = 3(2i + 3j) = 6i + 9j = \langle 6, 9 \rangle$

d) $2v - 3w = 2\langle 2,3 \rangle - 3\langle 3,-4 \rangle$

$= \langle 4,6 \rangle - \langle 9,-12 \rangle$

$= \langle -5, 18 \rangle = -5i + 18j$

e) $\|v\| = \sqrt{2^2 + 3^2} = \sqrt{4+9} = \sqrt{13}$



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