Magnet Precalculus CD
Vectors

Devin D. Droddy

Contents

Chapter 1

Geometric Representation of Vectors

1.1 Linear Combination

Definition 1.1.1: Linear Combination

The linear combination of a vector where a and b are respectively the horizontal and vertical components of the vector is $ai + bj$

Component form: $\langle a, b \rangle$
Standard position (position vector): initial point is the origin $(0, 0)$ and terminal point is (a, b)

1.2 Magnitude of Vectors

The magnitude (length) of a vector $v = \langle a, b \rangle$ is $||v|| = \sqrt{a^2 + b^2}$. If vector v is represented by the arrow from (x_1, y_1) to (x_2, y_2), then $||v|| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

1.3 Unit Vector

Definition 1.3.1: Unit Vector

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

$$u = \frac{v}{||v||}$$
$$i = \langle 1, 0 \rangle \text{ and } j = \langle 0, 1 \rangle$$

Generally in Magnet Precalculus, you'll be asked to find a unit vector in the same direction as a given vector. It's as simple as finding $\frac{1}{||v||} \langle a, b \rangle$, or $\left\langle \frac{a}{||v||}, \frac{b}{||v||} \right\rangle$.

1.4 Components of a Vector

Let v be a vector with magnitude $||v||$ and direction θ. Then, $v = \langle a, b \rangle = ai + bj$ where $a = ||v|| \cos(\theta)$ and $b = ||v|| \sin(\theta)$. Therefore, we can express v as $v = ||v|| \cos(\theta) i + ||v|| \sin(\theta) j$