6.4 Vectors and Dot Products

Dot Product

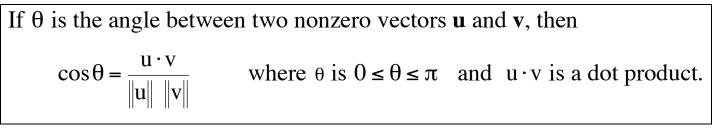
The dot product of
$$\mathbf{u} = \langle u_1, u_2 \rangle$$
 and $\mathbf{v} = \langle v_1, v_2 \rangle$ is:
 $\mathbf{u} \cdot \mathbf{v} = u_1 v_1 + u_2 v_2$

Example 1 Find each dot product.

a)
$$\langle 4,5 \rangle \cdot \langle 2,3 \rangle$$
 b) $\langle 2,-1 \rangle \cdot \langle 1,2 \rangle$ c) $\langle 0,3 \rangle \cdot \langle 4,-2 \rangle$

Example 2 Let
$$\mathbf{u} = \langle -1, 3 \rangle$$
, $\mathbf{v} = \langle 2, -4 \rangle$, and $\mathbf{w} = \langle 1, -2 \rangle$
a) $(\mathbf{u} \cdot \mathbf{v})\mathbf{w}$ b) $\mathbf{u} \cdot 2\mathbf{v}$

The Angle Between Two Vectors



Example 3 Find the angle between $\mathbf{u} = \langle 4, 3 \rangle$ and $\mathbf{v} = \langle 3, 5 \rangle$

Orthogonal Vectors

The vectors **u** and **v** are orthogonal if $\mathbf{u} \cdot \mathbf{v} = 0$

Example 4 Are the vectors $\mathbf{u} = \langle 2, -3 \rangle$ and $\mathbf{v} = \langle 6, 4 \rangle$ orthogonal ?