The Dot Product of Two Vectors

Name ____________________

Date ____________ Period ______

Given $\mathbf{v} = \langle a_1, b_1 \rangle = a_1\mathbf{i} + b_1\mathbf{j}$ and $\mathbf{w} = \langle a_2, b_2 \rangle = a_2\mathbf{i} + b_2\mathbf{j}$...

the dot product $\mathbf{v} \cdot \mathbf{w} = a_1 \cdot a_2 + b_1 \cdot b_2$

Given $\mathbf{v} = \langle 2, -4 \rangle$ and $\mathbf{w} = \langle 4, 6 \rangle$ find the following...

$\mathbf{v} \cdot \mathbf{w}$ $\quad$ $\mathbf{w} \cdot \mathbf{v}$ $\quad$ $\mathbf{v} \cdot \mathbf{v}$ $\quad$ $\mathbf{w} \cdot \mathbf{w}$

Given $\mathbf{v} = \langle a_1, b_1 \rangle = a_1\mathbf{i} + b_1\mathbf{j}$ and $\mathbf{w} = \langle a_2, b_2 \rangle = a_2\mathbf{i} + b_2\mathbf{j}$...

the dot product $\mathbf{v} \cdot \mathbf{w} = a_1 \cdot a_2 + b_1 \cdot b_2$

Given $\mathbf{v} = 6\mathbf{i} - 2\mathbf{j}$ and $\mathbf{w} = 3\mathbf{i} + 5\mathbf{j}$ find the following...

$\mathbf{v} \cdot \mathbf{w}$ $\quad$ $\mathbf{w} \cdot \mathbf{v}$ $\quad$ $\mathbf{v} \cdot \mathbf{v}$ $\quad$ $\mathbf{w} \cdot \mathbf{w}$

Given $\mathbf{v} = \langle a_1, b_1 \rangle = a_1\mathbf{i} + b_1\mathbf{j}$ and $\mathbf{w} = \langle a_2, b_2 \rangle = a_2\mathbf{i} + b_2\mathbf{j}$...

the dot product $\mathbf{v} \cdot \mathbf{w} = a_1 \cdot a_2 + b_1 \cdot b_2$

Properties of the Dot Product of Two Vectors

Commutative Property

$$\mathbf{v} \cdot \mathbf{w} = \mathbf{w} \cdot \mathbf{v}$$

Given $\mathbf{v} = \langle a_1, b_1 \rangle = a_1\mathbf{i} + b_1\mathbf{j}$ and $\mathbf{w} = \langle a_2, b_2 \rangle = a_2\mathbf{i} + b_2\mathbf{j}$...

the dot product $\mathbf{v} \cdot \mathbf{w} = a_1 \cdot a_2 + b_1 \cdot b_2$

Properties of the Dot Product of Two Vectors

Distributive Property

$\mathbf{u} = \langle a_3, b_3 \rangle = a_3\mathbf{i} + b_3\mathbf{j}$ $\quad\quad$ $\mathbf{u} \cdot (\mathbf{v} + \mathbf{w}) = \mathbf{u} \cdot \mathbf{v} + \mathbf{u} \cdot \mathbf{w}$

Given $\mathbf{v} = \langle a_1, b_1 \rangle = a_1\mathbf{i} + b_1\mathbf{j}$ and $\mathbf{w} = \langle a_2, b_2 \rangle = a_2\mathbf{i} + b_2\mathbf{j}$...

the dot product $\mathbf{v} \cdot \mathbf{w} = a_1 \cdot a_2 + b_1 \cdot b_2$

Properties of the Dot Product of Two Vectors

$$\mathbf{v} \cdot \mathbf{v} = \|\mathbf{v}\|^2$$

Given $\mathbf{v} = \langle a_1, b_1 \rangle = a_1\mathbf{i} + b_1\mathbf{j}$ and $\mathbf{w} = \langle a_2, b_2 \rangle = a_2\mathbf{i} + b_2\mathbf{j}$...

the dot product $\mathbf{v} \cdot \mathbf{w} = a_1 \cdot a_2 + b_1 \cdot b_2$

Properties of the Dot Product of Two Vectors

$$\mathbf{0} \cdot \mathbf{v} = 0$$

Given $\mathbf{v} = \langle a_1, b_1 \rangle = a_1\mathbf{i} + b_1\mathbf{j}$ and $\mathbf{w} = \langle a_2, b_2 \rangle = a_2\mathbf{i} + b_2\mathbf{j}$...

the dot product $\mathbf{v} \cdot \mathbf{w} = a_1 \cdot a_2 + b_1 \cdot b_2$

Commutative Property

$$\mathbf{v} \cdot \mathbf{w} = \mathbf{w} \cdot \mathbf{v}$$

Distributive Property

$$\mathbf{u} \cdot (\mathbf{v} + \mathbf{w}) = \mathbf{u} \cdot \mathbf{v} + \mathbf{u} \cdot \mathbf{w}$$

$$\mathbf{v} \cdot \mathbf{v} = \|\mathbf{v}\|^2 \qquad \mathbf{0} \cdot \mathbf{v} = 0$$