***The Dot Product***

Students will find the dot product, find the angle between two vectors and determine if vectors areorthogonal.

**Precalculus**

**Definition of Dot Product:**

The dot product of two vectors results in a **number**, *not a vector.*

If **v** = a1***i*** + b1***j*** and **w** = a2***i*** + b2***j***, then the dot product is:

**v∙w** = a1a2 + b1b2

Example 1: *Find the Dot Product.*

**v = 5i – 2j w = -3i + 4j**

1. **v●w**
2. **w●v**
3. **v●v**

**v = 7i – 4j w = 2i - j**

1. **v●w**
2. **w●v**
3. **w●w**

How do you find the dot product?

***6.7 The Dot Product***

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**Precalculus**

***Properties of the Dot Product***

1. **u●v = v●u**
2. **u●(v+w) = u●v + u●w**
3. **0●v = 0**
4. **v●v = ||v||2**
5. **(cu)●v = c(u●v) = u●(CV)**

**Finding the Angle between two Vectors**

$cos θ= \frac{v●w}{\left‖v\right‖\left‖w\right‖}$ **so** $θ= cos^{-1}(\frac{v●w}{\left‖v\right‖\left‖w\right‖})$

**Example 2: Find the angle between the two vectors.**

1. **v = 3i – 2j w = -i + 4j**

**b. v = 4i – 3j w = i + 2j**

What are the properties of the dot product?

How do you find the sngle between two vectors?

***6.7 The Dot Product***

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**Precalculus**

***Determining if Vectors Are Parallel, Orthogonal or Neither.***

**“orthogonal” means perpendicular**

**To determine if vectors are parallel, orthogonal or neither find the angle between the two vectors.**

|  |  |
| --- | --- |
| **θ** | **Parallel, Orthogonal, or Neither** |
| **0˚** |  |
| **180˚** |  |
| **90˚** |  |
| **other** |  |

**Example 3: Determine if the vectors are Parallel, Orthogonal or Neither.**

1. **v = 6i – 3j w = i + 2j**

**b. v = 4i – 3j w = -8i + 6j**

What are orthogonal vectors?

***6.7 The Dot Product Day 2***

Students will find the projection of one vector onto another, express a vector as the sum of two orthogonal vectors and compute work

**Precalculus**

***Projection of a vector onto another vector***

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***6.7 The Dot Product Day 2***

Students will find the projection of one vector onto another, express a vector as the sum of two orthogonal vectors and compute work.

**Precalculus**

**Example 4:** Find the vector projection of **v** onto **w**.

 **v** = 2***i*** + 4***j* w** = -2***i*** + 6***j***

**The vector components of v**

***6.7 The Dot Product Day 2***

Students will find the projection of one vector onto another, express a vector as the sum of two orthogonal vectors and compute work

**Precalculus**

**Example 5:** Decompose **v** into vectors **v1** and **v2**, where **v1** is parallel to **w** and **v2** is orthogonal to **w.**

**Definition of Work**

**Example 6:** A child pulls a wagon along level ground by exerting a force of 20 pounds on the handle that makes a 30 angle with the horizontal. How much work is done pulling the wagon 150 feet?