Course Number
Instructor
Date

Section 8.4 Vectors and Dot Products

Objective: In this lesson you learned how to find the dot product of two vectors and find the angle between two vectors.

Important Vocabulary	Define each term or concept.
Angle between two nonzero vectors	
Orthogonal	

I. The Dot Product of Two Vectors (Pages 612–613)

> ***What you should learn***
> How to find the dot product of two vectors and use the Properties of the Dot Product

The **dot product** of **u** = $\langle u_1, u_2\rangle$ and **v** = $\langle v_1, v_2\rangle$ is

________________________. This product yields a ___________.

Let **u**, **v**, and **w** be vectors in the plane or in space and let c be a scalar. Complete the following properties of the dot product:

1. **u • v** = _______________
2. **0 • v** = ____________
3. **u • (v + w)** = _____________________
4. **v • v** = ________________
5. c(**u • v**) = _______________ = ________________

Example 1: Find the dot product: $\langle 5, -4\rangle \bullet \langle 9, -2\rangle$.

II. The Angle Between Two Vectors (Pages 613–615)

> ***What you should learn***
> How to find the angle between two vectors and how to determine whether two vectors are orthogonal

If q is the angle between two nonzero vectors **u** and **v**, then q can be determined from _____________________________________.

Example 2: Find the angle between **v** = $\langle 5, -4\rangle$ and **w** = $\langle 9, -2\rangle$.

An alternative way to calculate the dot product between two vectors **u** and **v**, given the angle q between them, is ______________________________.

Two vectors **u** and **v** are orthogonal if ________________.

Example 3: Are the vectors $\mathbf{u} = \langle 1, -4 \rangle$ and $\mathbf{v} = \langle 6, 2 \rangle$ orthogonal?

III. Finding Vector Components (Pages 615–616)

> ***What you should learn***
> How to write a vector as the sum of two vector components

Let **u** and **v** be nonzero vectors such that $\mathbf{u} = \mathbf{w}_1 + \mathbf{w}_2$, where $\mathbf{w}_1$ and $\mathbf{w}_2$ are orthogonal and $\mathbf{w}_1$ is parallel to (or a scalar multiple of) **v**. The vectors $\mathbf{w}_1$ and $\mathbf{w}_2$ are called _____________________ ____________. The vector $\mathbf{w}_1$ is the **projection** of **u** onto **v** and is denoted by ____________________. The vector $\mathbf{w}_2$ is given by ____________________ .

Let **u** and **v** be nonzero vectors. The projection of **u** onto **v** is given by $\text{proj}_{\mathbf{v}}\, \mathbf{u}$ = ______________________________.

IV. Work (Page 617)

> ***What you should learn***
> How to use vectors to find the work done by a force

The **work** W done by a constant force **F** as its point of application moves along the vector $\overrightarrow{PQ}$ is given by either of the following:

1.

2.

> **Homework Assignment**
>
> Page(s)
>
> Exercises