Name: _____ April 30, 2020

Dot Product and Angles Between Vectors

Part I: Consider the following vectors:

$\mathbf{d} = \langle 3, 7 \rangle$ $\mathbf{r} = 4\mathbf{i} - 2\mathbf{j}$ $\mathbf{f} = \langle 1, -1 \rangle$ $\mathbf{w} = -\mathbf{i} + \mathbf{j}$ $\mathbf{h} = \langle 0, 2 \rangle$

$\mathbf{u} = 2\mathbf{i} - 3\mathbf{j}$ $\mathbf{t} = \langle -5, 8 \rangle$ $\mathbf{s} = \langle 6, 4 \rangle$ $\mathbf{x} = 4\mathbf{i} + 2\mathbf{j}$ $\mathbf{k} = -3\mathbf{i}$

Find the following dot products:

1. $\mathbf{d} \bullet \mathbf{r}$ =

2. $\mathbf{u} \bullet \mathbf{s}$ =

3. $\mathbf{w} \bullet \mathbf{w}$ =

4. $\mathbf{f} \bullet \mathbf{x}$ =

5. $\mathbf{f} \bullet \mathbf{w}$ =

6. $\mathbf{t} \bullet \mathbf{s}$ =

7. $\mathbf{x} \bullet \mathbf{h}$ =

8. $\mathbf{r} \bullet \mathbf{r}$ =

9. $\mathbf{h} \bullet \mathbf{k}$ =

Which pairs of vectors in problems 1 – 9 are orthogonal?

Part II: Use the vectors **u** *and* **v** *to complete each row.*

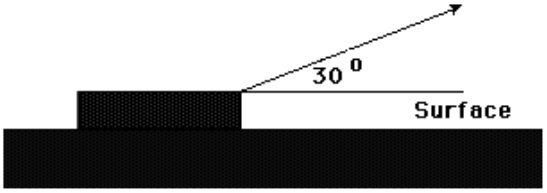
	u	**v**	$\lvert\mathbf{u}\rvert$	$\lvert\mathbf{v}\rvert$	$\mathbf{u} \bullet \mathbf{v}$	Angle Between the Vectors
10.	$\langle 3, 4 \rangle$	$\langle 0, 1 \rangle$				
11.	$\langle -2, 3 \rangle$	$\langle 5, 3 \rangle$				
12.	$\mathbf{i} - 3\mathbf{j}$	$3\mathbf{i} + \mathbf{j}$				
13.	$3\mathbf{i} + 5\mathbf{j}$	$-\mathbf{i} + \mathbf{j}$				
14.	$\langle 5, 0 \rangle$	$\langle -1, -1 \rangle$				
15.	$2\mathbf{i} + 6\mathbf{j}$	$-3\mathbf{i} + \mathbf{j}$				

Name: _____ April 30, 2020

Dot Product Applications

1. The work done on an object is defined as the dot product between the force vector (the force applied) and the displacement vector (how far the object moves). Find the work done by a force F in moving an object from *P* to *Q* where the force vector is 10i + 3j and the displacement vector is between *P*(2, 3) and *Q*(6,-2).

2. The work done on an object is defined as the dot product between the force vector (the force applied) and the displacement vector (how far the object moves). A force of 50 N acts on the block at the angle shown in the diagram. The block moves a horizontal distance of 3.0 m.



3. A box is being pulled by means of two ropes. One rope exerts 90 pounds of force at 16° above the horizontal. The other rope exerts 62 pounds of force at 25° below the horizontal. Find the resultant of the two forces. Find the direction of the resultant. If the box moves 10 ft in that same direction, write a vector to describe its displacement. Find the work done on the box (dot product of the force resultant and the displacement vector).