Precalculus Unit 7 Homework—Dot Product

Find the dot product of the given vectors.

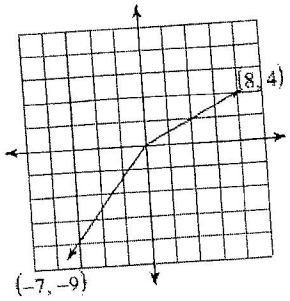
1) $\vec{u} = \langle 3, 9 \rangle$
$\vec{v} = \langle 6, 5 \rangle$

63

2) $\vec{u} = -\vec{i} + 5\vec{j}$
$\vec{v} = -6\vec{i} - 2\vec{j}$

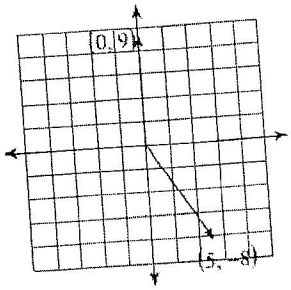
-4

3)



-92

4)



-72

State if the two vectors are parallel, orthogonal, or neither.

5) $\vec{u} = \langle 4, -9 \rangle$
$\vec{v} = \langle -9, 4 \rangle$

$\vec{u} \cdot \vec{v} = -72$

$\theta = 137.9^\circ$ neither

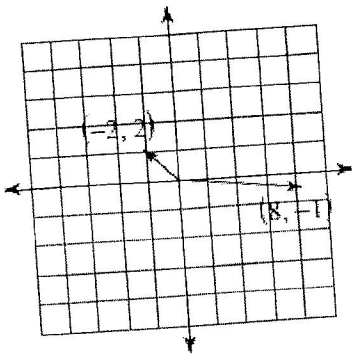
6) $\vec{u} = -5\vec{i} - 2\vec{j}$
$\vec{v} = -10\vec{i} + 25\vec{j}$

$\vec{u} \cdot \vec{v} = 0$ orthogonal

$\theta = 90^\circ$

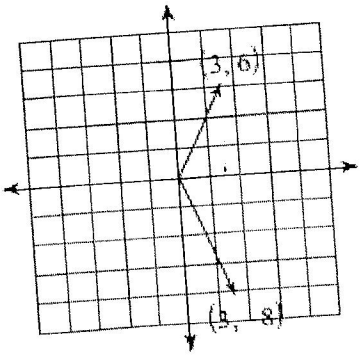
Find the measure of the angle between the two vectors.

7)



142.13°

8)



132.88°

9) $\vec{u} = \langle -8, -2 \rangle$
$\vec{v} = \langle -3, 3 \rangle$

59.0°

10) $\vec{u} = -8\vec{j}$
$\vec{v} = -9\vec{i} - 2\vec{j}$

77.47°

Find the projection of u onto v.

11) $\vec{u} = \langle 8, 2 \rangle$
$\vec{v} = \langle -7, -3 \rangle$

$\left\langle \frac{217}{29}, \frac{93}{29} \right\rangle$

12) $\vec{u} = 5\vec{i} - 5\vec{j}$
$\vec{v} = 7\vec{i} - 5\vec{j}$

$\left\langle \frac{-35}{37}, \frac{25}{37} \right\rangle$

Find the projection of u onto v. Then write u as the sum of two orthogonal vectors.

13) $\vec{u} = \langle -2, -3 \rangle$
$\vec{v} = \langle -7, 9 \rangle$

$\langle .7, -.9 \rangle$

$\vec{u} = \langle .7, -.9 \rangle + \langle -2.7, -2.1 \rangle$

Practice with Dot Products and Angles between Vectors

1) Find the dot product of **u** and **v**. Then determine if it is orthogonal.

a) $u = \langle 3,-2 \rangle$ *and* $v = \langle -5,1 \rangle$

-17

no

b) $u = \langle -2,-3 \rangle$ *and* $v = \langle 9,-6 \rangle$

0

yes

c) $u = \langle -3,4 \rangle$ *and* $v = \langle 3,6 \rangle$

15

no

d) $u = \langle 2,7 \rangle$ *and* $v = \langle -14,4 \rangle$

0

yes

2) Find the magnitude of:

a) $c = \langle -1,-7 \rangle$

$\sqrt{50} = 5\sqrt{2}$

b) $a = \langle -6,5 \rangle$

$\sqrt{61}$

c) $m = \langle -3,11 \rangle$

$\sqrt{130}$

3) Find the angle θ between vectors **u** and **v** to the nearest tenth of a degree.

a) $u = \langle -5,-2 \rangle$ *and* $v = \langle 4,4 \rangle$

$\theta = 156.8^\circ$

b) $u = \langle 9,5 \rangle$ *and* $v = \langle -6,7 \rangle$

$\theta = 101.5^\circ$

c) $u = \langle -3,-5 \rangle$ *and* $v = \langle 2,-3 \rangle$

$\theta = 64.7^\circ$

d) $u = \langle 1,-4 \rangle$ *and* $v = \langle 2,6 \rangle$

$\theta = 147.5^\circ$