## 9.2: (The Dot Product)

If  $\theta$  is the smallest angle between the vector  $u = \langle 2, 1 \rangle$  and  $v = \langle -3, 1 \rangle$ , then  $\sin \theta =$ 

a)  $\frac{\sqrt{2}}{2}$ b)  $-\frac{\sqrt{2}}{2}$ c)  $\frac{\sqrt{3}}{2}$ d)  $\frac{1}{2}$ e)  $-\frac{1}{2}$ 

The smallest positive angle between the vectors  $u=\langle 2,-2\sqrt{3}\rangle$  and  $v=-2\sqrt{3}i+2j$  is

- A) 120°
- B) 135°
- C) 30°
- D) 60°

<mark>E) 150°</mark>

Let u and v be two vectors. If |u| = 4, |v| = 4 and  $|u + v| = 5\sqrt{2}$ , then  $u \cdot v =$ A) 7 B) 8 C) 16 D) 9

E) 6

If u and v are unit vectors and the angle between u and v is  $120^\circ,$  then |u-v| is equal to

<mark>a) √3</mark>
b) 5
c) $\sqrt{2}$
d) 0
e) $\frac{1}{2}$

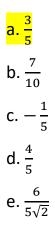
For the vectors  $u = \langle 0, 5 \rangle$  and  $v = \langle -2, 2 \rangle$ , the smallest positive angle between the vectors u + i and v + j is

a. 
$$\cos^{-1} \frac{1}{2}$$
  
b.  $\cos^{-1} \left( -\frac{2}{\sqrt{13}} \right)$   
c. 120°  
d. 45°  
e. 135°

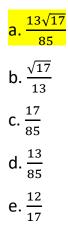
The smallest positive angle between the vectors  $u = \cos\left(\frac{\pi}{2}\right)i + \sin\left(\frac{\pi}{2}\right)j$  and  $w = \cos\left(\frac{3\pi}{4}\right)i + \sin\left(\frac{3\pi}{4}\right)j$ , is equal to

- a) 75°
- b) 15°
- c) 105°
- <mark>d) 45°</mark>
- e) 30°

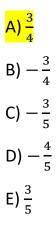
The cosine of the smallest positive angle between the vectors  $u = \langle -1,1 \rangle$  and  $v = \langle 1,7 \rangle$  is equal to



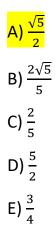
If  $\alpha$  is the smallest positive angle between the two vectors u = 4i - 3j and v = < 4,1 >, then  $\cos \alpha =$ 



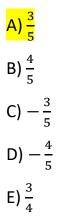
If  $\alpha$  is the angle between the vectors  $\mathbf{u} = \mathbf{i} + 3\mathbf{j}$  and  $\mathbf{v} = -\mathbf{i} + 3\mathbf{j}$ , then  $\tan \alpha =$ 



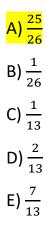
If  $\theta$  is the smallest positive angle between the two vectors  $u = \langle 3, 4 \rangle$  and v = 2i + j, then sec  $\theta =$ 



If  $\alpha$  is the angle between the vectors 3i + 4j and j, where  $0^{\circ} \le \alpha \le 180^{\circ}$  then  $\sin \alpha =$ 



If  $\alpha$  is the smallest angle between the vectors  $\vec{u} = \langle 3, -2 \rangle$  and  $\vec{v} = \langle 2, -2 \rangle$ , then  $\cos^2 \alpha =$ 



If  $\alpha$  is the smallest positive angle between the vectors u = (3, -4) and v = (-2,1), then  $\cot \alpha =$ 

A) -2 B)  $-\frac{2}{5}$ C) -3 D)  $\frac{2}{5}$ E)  $\frac{1}{2}$ 

The angle between the vectors  $u = \langle 2, 1 \rangle$  and v = -3i + j is equal to

<mark>A) 135°</mark>

B) 210°

**C)** 45°

D) 120°

E) 150°

Which one of the following statements is TRUE?

A) If  $\vec{v} = \langle -\frac{4}{5}, -\frac{3}{5} \rangle$ , then  $\vec{v}$  is a unit vector.

B) If  $\vec{u} = \langle 3, 2 \rangle$  and  $\vec{v} = \langle -1, 1 \rangle$ , then  $\vec{u}$  and  $\vec{v}$  are perpendicular.

C) If  $\vec{u} = \langle 3, 2 \rangle$ , then it can be written as  $\vec{u} = 2\vec{i} + 3\vec{j}$ .

D) If  $\vec{u} = \langle 3, 2 \rangle$  and  $\vec{v} = \langle 1, 3 \rangle$ , then  $\vec{u} \cdot \vec{v} = 3$ .

E) If  $\alpha$  is the angle between the vectors  $\vec{u}$  and  $\vec{v}$ , then  $\tan \alpha = \frac{\vec{u} \cdot \vec{v}}{|\vec{u}||\vec{v}|}$ 

For the vectors s, u, v and w and the real number k, which one of the following statements is FALSE?

A) s =  $\langle 1,1 \rangle$  is a unit vector B) u · v = v · u C) u · (v + w) = u · v + u · w D) (ku) · v = u · (kv) E) u · u = |u|<sup>2</sup> If  $\alpha$  is the smallest positive angle between the vectors u=-i+5j and v=4i+6j , then  $\alpha=$ 

<mark>A) 45°</mark>

B) 60°

C) 135°

D) 120°

E) 30°

Let  $\vec{u}$  and  $\vec{w}$  be two vectors such that  $\vec{u} = 2i + 2\sqrt{3}j$  and  $\vec{w}$  has magnitude 3 and direction angle 120°, then the smallest angle between  $\vec{u}$  and  $\vec{w}$  is

- <mark>(a) 60°</mark>
- (b) 30°
- (c) 45°
- (d) 120°
- (e) 150°

Let  $a = \cos^{-1}\left(-\frac{2}{\sqrt{5}}\right)$  be the smallest positive angle between the vectors u and v. If |u| = 5 and  $|v| = \sqrt{5}$  are the magnitudes of u and v, then the dot product  $u \cdot v =$ 

A) -10 B)  $-\frac{25}{2}$ C)  $-\frac{1}{2}$ D) -5 E)  $-\sqrt{5}$ 

Which one of the following statements is TRUE?

(a) The vector (sin 25°, sin 65°) is a unit vector.

- (b) The vectors  $\langle -1,1 \rangle$  and  $\langle 2,-2 \rangle$  are perpendicular.
- (c) The vectors (1, -1) and (2, -2) have the same magnitude.
- (d) The vectors  $\langle -4, -4 \rangle$  and  $\langle 4, 4 \rangle$  have the same direction.
- (e) The dot product of two vectors is a vector.

If the vectors  $u = \langle \sin 20^\circ, \cos 20^\circ \rangle$  and  $v = \langle \cos 80^\circ, -\sin 80^\circ \rangle$ , then  $u \cdot v = \langle \cos 80^\circ, -\sin 80^\circ \rangle$ 

A) 
$$-\frac{\sqrt{3}}{2}$$
  
B)  $-\frac{1}{2}$   
C)  $\frac{1}{2}$   
D) cos 100°  
E)  $-\sin 100^{\circ}$ 

Let  $u = \langle 2, -1 \rangle$ ,  $v = \langle 1, -2 \rangle$ , and w = 12i + aj. If w is orthogonal to the vector -2u + 3v, then a =

<mark>a) -3</mark>

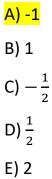
b) 2

c) -6

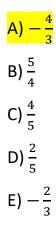
d) 1

e) 4

Let u and v be two vectors such that u = ki - j and v is vector of magnitude  $\frac{\sqrt{2}}{2}$  and direction angle  $\frac{3\pi}{4}$ . If u and v are perpendicular then k =



If  $u = \cos \frac{3\pi}{4}i + \sin \frac{3\pi}{4}j$  and  $v = \langle 4k + 1, k - 3 \rangle$  are perpendicular, then k =



If the vectors  $u = \frac{5r}{7}i + \frac{1}{3}j$  and  $v = <\frac{r}{5}, -\frac{2}{7}>$  are orthogonal, then a possible value of r is

a.  $\frac{\sqrt{6}}{3}$ b.  $\frac{\sqrt{3}}{3}$ c.  $\frac{\sqrt{2}}{2}$ d.  $\frac{\sqrt{6}}{2}$ e.  $\frac{\sqrt{3}}{2}$ 

Let u and v be two vectors such that  $u = -\sqrt{3}i - kj$  and v is a vector with magnitude 2 and direction angle 150°. If u and v are perpendicular vectors, then the value of k is

<mark>A) 3</mark>

- B) 2
- C) -1
- D) 4
- E) 0

If the vectors  $\mathbf{u} = (k - 1)\mathbf{i} + \mathbf{j}$  and  $\mathbf{v} = 3\mathbf{i} + (k + 1)\mathbf{j}$  are perpendicular, then k is equal to

A)  $\frac{1}{2}$ B)  $\frac{5}{8}$ C) 2 D) 4 E)  $\frac{1}{4}$