9.2: (The Dot Product)

If θ 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 $\mathrm{u} = \langle 2, -2\sqrt{3} \rangle$ and $\mathrm{v} = -2\sqrt{3}\mathrm{i} + 2\mathrm{j}$ is

A) $120°$

B) $135°$

C) $30°$

D) $60°$

E) $150°$

Let u and v be two vectors. If $|\mathrm{u}| = 4$, $|\mathrm{v}| = 4$ and $|\mathrm{u} + \mathrm{v}| = 5\sqrt{2}$, then $\mathrm{u} \cdot \mathrm{v} =$

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 $120°$, then $|u - v|$ is equal to

a) $\sqrt{3}$

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) $105°$

d) $45°$

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

a. $\frac{3}{5}$

b. $\frac{7}{10}$

c. $-\frac{1}{5}$

d. $\frac{4}{5}$

e. $\frac{6}{5\sqrt{2}}$

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

a. $\frac{13\sqrt{17}}{85}$

b. $\frac{\sqrt{17}}{13}$

c. $\frac{17}{85}$

d. $\frac{13}{85}$

e. $\frac{12}{17}$

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

A) $\frac{3}{4}$

B) $-\frac{3}{4}$

C) $-\frac{3}{5}$

D) $-\frac{4}{5}$

E) $\frac{3}{5}$

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

A) $\frac{\sqrt{5}}{2}$

B) $\frac{2\sqrt{5}}{5}$

C) $\frac{2}{5}$

D) $\frac{5}{2}$

E) $\frac{3}{4}$

If α is the angle between the vectors $3\text{i} + 4\text{j}$ and j, where $0° \leq \alpha \leq 180°$ then $\sin \alpha =$

A) $\frac{3}{5}$

B) $\frac{4}{5}$

C) $-\frac{3}{5}$

D) $-\frac{4}{5}$

E) $\frac{3}{4}$

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

A) $\frac{25}{26}$

B) $\frac{1}{26}$

C) $\frac{1}{13}$

D) $\frac{2}{13}$

E) $\frac{7}{13}$

If α is the smallest positive angle between the vectors $\mathrm{u} = \langle 3, -4 \rangle$ and $\mathrm{v} = \langle -2,1 \rangle$, 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 $v = -3\mathrm{i} + \mathrm{j}$ is equal to

A) $135°$

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 $\vec{u} = 2\vec{\imath} + 3\vec{\jmath}$.

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

E) If α 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 $\mathrm{s}, \mathrm{u}, \mathrm{v}$ and w and the real number k, which one of the following statements is FALSE?

A) $\mathrm{s} = \langle 1,1 \rangle$ is a unit vector

B) $\mathrm{u} \cdot \mathrm{v} = \mathrm{v} \cdot \mathrm{u}$

C) $\mathrm{u} \cdot (\mathrm{v} + \mathrm{w}) = \mathrm{u} \cdot \mathrm{v} + \mathrm{u} \cdot \mathrm{w}$

D) $(k\mathrm{u}) \cdot \mathrm{v} = \mathrm{u} \cdot (k\mathrm{v})$

E) $\mathrm{u} \cdot \mathrm{u} = |\mathrm{u}|^2$

If α is the smallest positive angle between the vectors $\mathrm{u} = -\mathrm{i} + 5\mathrm{j}$ and $\mathrm{v} = 4\mathrm{i} + 6\mathrm{j}$, then $\alpha =$

A) $45°$

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

(a) $60°$
(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 $|\mathrm{u}| = 5$ and $|\mathrm{v}| = \sqrt{5}$ are the magnitudes of u and v, then the dot product $\mathrm{u} \cdot \mathrm{v} =$

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 $\langle \sin 25°, \sin 65° \rangle$ is a unit vector.
(b) The vectors $\langle -1,1 \rangle$ and $\langle 2,-2 \rangle$ are perpendicular.
(c) The vectors $\langle 1,-1 \rangle$ and $\langle 2,-2 \rangle$ 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 $\mathrm{u} = \langle \sin 20°, \cos 20° \rangle$ and $\mathrm{v} = \langle \cos 80°, -\sin 80° \rangle$, then $\mathrm{u} \cdot \mathrm{v} =$

A) $-\frac{\sqrt{3}}{2}$

B) $-\frac{1}{2}$

C) $\frac{1}{2}$

D) $\cos 100°$

E) $-\sin 100°$

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 $a =$

a) -3

b) 2

c) -6

d) 1

e) 4

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

A) -1

B) 1

C) $-\frac{1}{2}$

D) $\frac{1}{2}$

E) 2

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

A) $-\frac{4}{3}$

B) $\frac{5}{4}$

C) $\frac{4}{5}$

D) $\frac{2}{5}$

E) $-\frac{2}{3}$

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

A) 3

B) 2

C) -1

D) 4

E) 0

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

A) $\frac{1}{2}$

B) $\frac{5}{8}$

C) 2

D) 4

E) $\frac{1}{4}$