CHAPTER 9.1

Vectors in Two Dimensions

Multiple-Choice Old Exam Questions

10 questions • 2 topics • options A–E • two questions per page

Topic 1 | Vector Operations and Components

Adding, subtracting and scaling vectors, finding components, and finding unit vectors • Questions 1–4

Q **1**

If the vector $\mathbf{u}$ has magnitude 8, direction angle $120°$ and the vector $\mathbf{v} = \sqrt{3}\mathbf{i} + 4\mathbf{j}$, then the vector $\mathbf{u} - \sqrt{3}\mathbf{v} =$

A) $\langle -7, 0 \rangle$

B) $\langle 2, -1 \rangle$

C) $\langle 7, 8\sqrt{3} \rangle$

D) $\langle -7, -8\sqrt{3} \rangle$

E) $\langle -3 + 4\sqrt{3}, -4 + 4\sqrt{3} \rangle$

Q **2**

If $\mathbf{u}$ is a vector of magnitude $8\sqrt{2}$ and direction $135°$ and $\mathbf{v} = 3\mathbf{i} - 2\mathbf{j}$, then the vertical component of the vector $\mathbf{w} = \mathbf{u} + 2\mathbf{v}$ is

A) 4

B) -4

C) -2

D) 6

E) 2

Q
3

Given the vectors $\mathbf{u} = \langle -4,\ 10 \rangle$ and $\mathbf{v} = \langle -5,\ 1 \rangle$. If the vector $\mathbf{w} = \langle a,\ b \rangle$ is a unit vector in the opposite direction of $\frac{1}{2}\mathbf{u} - \mathbf{v}$, then $a + b$ is equal to

A) $-\frac{7}{5}$

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

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

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

E) $-\frac{9}{5}$

Q
4

Let $\mathbf{u} = \langle -6,\ 1 \rangle$ and $\mathbf{v} = \langle -4,\ 3 \rangle$. If $\mathbf{w} = 4\mathbf{u} - 3\mathbf{v}$, then a unit vector having the same direction as $\mathbf{w}$ is

A) $\left\langle -\frac{12}{13}, -\frac{5}{13} \right\rangle$

B) $\left\langle \frac{12}{13}, -\frac{5}{13} \right\rangle$

C) $\left\langle -\frac{12}{13}, \frac{5}{13} \right\rangle$

D) $\left\langle \frac{4}{5}, -\frac{3}{5} \right\rangle$

E) $\left\langle \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right\rangle$

Topic 2 | Magnitude and Direction Angle

Finding the magnitude and direction angle of a vector, from components, from a figure, or from the direction angle of another vector
• Questions 5–10

Q
5

Let $\mathbf{u} = \mathbf{i}$ and $\mathbf{v} = 2\sqrt{3}\mathbf{i} - 4\mathbf{j}$ be two vectors. If θ is the direction angle of the vector $2\mathbf{u} - \sqrt{3}\mathbf{v}$, then $\sin\theta =$

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

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

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

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

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

Q
6

If the vector $\mathbf{u}$ has magnitude 8 and direction angle π, and the vector $\mathbf{v} = 4\mathbf{i} + 4\sqrt{3}\mathbf{j}$, then the direction angle α of the vector $\mathbf{u} + \mathbf{v}$ is

A) $\alpha = \frac{2\pi}{3}$

B) $\alpha = \frac{11\pi}{6}$

C) $\alpha = \frac{4\pi}{3}$

D) $\alpha = \frac{5\pi}{6}$

E) $\alpha = \frac{5\pi}{3}$

Q
7

Given the vectors $\mathbf{u} = \langle 9,\ 24\rangle$ and $\mathbf{v} = 10\mathbf{i} + 12\mathbf{j}$. If $\mathbf{w} = \frac{1}{2}\mathbf{u} - \frac{3}{4}\mathbf{v}$, then the direction angle of the vector $\mathbf{w}$ is

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

B) $\frac{7\pi}{4}$

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

D) $\frac{11\pi}{6}$

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

Q
8

If $\mathbf{u} = \langle 1,\ 0\rangle$ and $\mathbf{v} = \langle 2\sqrt{3},\ -4\rangle$, then the magnitude r and the direction angle θ of the vector $2\mathbf{u} - \sqrt{3}\mathbf{v}$ are

A) $r = 8,\ \theta = 120°$

B) $r = 8,\ \theta = 150°$

C) $r = 16,\ \theta = 210°$

D) $r = 4,\ \theta = 300°$

E) $r = 4,\ \theta = 330°$

Q
9

If $\mathbf{u} = \langle -2\sqrt{3},\ 4 \rangle$ and $\mathbf{v} = \sqrt{3}\mathbf{i} + \mathbf{j}$, then the direction angle of the vector $\mathbf{u} - \mathbf{v}$ is

A) $150°$

B) $135°$

C) $30°$

D) $60°$

E) $120°$

Q
10

In the adjacent figure, the magnitude M and the direction θ of the vector $\mathbf{u}$ are

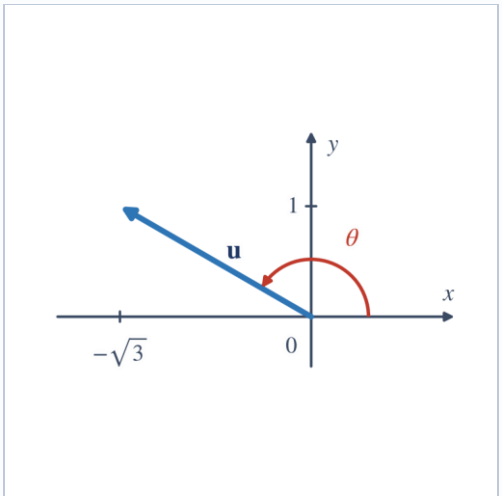
A) $M = 2,\ \theta = \frac{5\pi}{6}$

B) $M = \sqrt{2},\ \theta = \frac{5\pi}{6}$

C) $M = \sqrt{2},\ \theta = \frac{2\pi}{3}$

D) $M = 2,\ \theta = \frac{2\pi}{3}$

E) $M = 2,\ \theta = \frac{11\pi}{6}$



Answer Key

"Original" shows the question number in the source worksheet.

Q	Original	Ans.	Value
1	1	**A**	$\langle -7,\ 0 \rangle$
2	3	**A**	4
3	9	**A**	$-\frac{7}{5}$
4	10	**A**	$\left\langle -\frac{12}{13}, -\frac{5}{13} \right\rangle$
5	2	**A**	$\frac{\sqrt{3}}{2}$
6	4	**A**	$\alpha = \frac{2\pi}{3}$
7	5	**A**	$\frac{3\pi}{4}$
8	6	**A**	$r = 8,\ \theta = 120°$
9	7	**A**	$150°$
10	8	**A**	$M = 2,\ \theta = \frac{5\pi}{6}$