

A vector  $\mathbf{v}$  has the given initial and terminal point. Find the position vector.

1. Initial point  $(3, 7)$       Terminal point  $(3, -2)$
2. Initial point  $(-2, 1)$       Terminal point  $(7, 6)$
3. Initial point  $(4, 6)$       Terminal point  $(7, 2)$
4. Initial point  $(1, 8)$       Terminal point  $(3, -7)$

Calculate the magnitude and direction of the given vector.

5.  $\mathbf{u}$  with initial point  $(1, 8)$  and terminal point  $(-2, 12)$
6. Complex vector  $\mathbf{v}$  with  $\mathbf{v} = -2 + 7i$
7.  $5\mathbf{v}$  with  $\mathbf{v} = \langle -1, -4 \rangle$
8.  $\mathbf{w}$  given  $\mathbf{u} = 3\mathbf{i} + 2\mathbf{j}$ ,  $\mathbf{v} = \mathbf{i} - \mathbf{j}$ , and  $\mathbf{w} = 3\mathbf{u} - 2\mathbf{v}$

Given vectors  $\mathbf{u}$  and  $\mathbf{v}$ , find  $\mathbf{u} + \mathbf{v}$ , and  $\mathbf{u} - \mathbf{v}$ .

9.  $\mathbf{u} = \langle 4, 2 \rangle$  and  $\mathbf{v} = \langle 7, 1 \rangle$
10.  $\mathbf{u} = \langle -5, -2 \rangle$  and  $\mathbf{v} = \langle 1, -3 \rangle$
11.  $\mathbf{u} = \mathbf{i} + \mathbf{j}$  and  $\mathbf{v} = 2\mathbf{i} - 3\mathbf{j}$
12.  $\mathbf{u} = 2\mathbf{i} - \mathbf{j}$  and  $\mathbf{v} = -\mathbf{i} + \mathbf{j}$

Determine which pairs of vectors are orthogonal.

13.  $\mathbf{v} = -2\mathbf{i}$  and  $\mathbf{w} = 5\mathbf{j}$

14.  $\mathbf{v} = -2\mathbf{i} + \mathbf{j}$  and  $\mathbf{w} = \mathbf{i} + 2\mathbf{j}$

15.  $\mathbf{v} = \mathbf{i} + \mathbf{j}$  and  $\mathbf{w} = \frac{1}{2}\mathbf{i} + \frac{1}{2}\mathbf{j}$

16.  $\mathbf{v} = 2\mathbf{i} - 3\mathbf{j}$  and  $\mathbf{w} = \mathbf{i} + \mathbf{j}$

Convert the complex number to either rectangular or polar form (whichever is not given).

17.  $5 - 3i$

18.  $4 \cos 234^\circ + 4i \sin 234^\circ$

19.  $2i - 6$

20.  $7(\cos 65^\circ + i \sin 65^\circ)$

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21. Find the angle between the vectors  $u = 4i - 5j$  and  $v = 2i + 9j$ .

22. Find the component form of the vector  $v$  with  $\|v\|=6$ , in the same direction as

$$u = \langle -2, 7 \rangle.$$

23. A jet is flying with an air speed of 480 miles per hour at a bearing of N82°E (8°).

Because of the wind, the ground speed of the plane is 518 miles per hour at a bearing of N79°E (11°). What are the speed and direction of the wind?

24. An airplane is traveling due west with a speed of 500 miles per hour. The wind blows at 65 miles per hour at an angle of S20°W. What is the resultant speed and direction of the airplane's flight?

## Answers to Review

1.  $\langle 0, -9 \rangle$ ;  $\mathbf{v} = -9\mathbf{j}$
2.  $\langle 9, 5 \rangle$ ;  $\mathbf{v} = 9\mathbf{i} + 5\mathbf{j}$
3.  $\langle 3, -4 \rangle$ ;  $\mathbf{v} = 3\mathbf{i} - 4\mathbf{j}$
4.  $\langle 2, -15 \rangle$ ;  $\mathbf{v} = 2\mathbf{i} - 15\mathbf{j}$
5.  $\|\mathbf{v}\| = 5, \theta = 126.86^\circ$
6.  $\|\mathbf{v}\| = 7.28, \theta = 105.95^\circ$
7.  $\|\mathbf{v}\| = 20.62, \theta = 256^\circ$
8.  $\|\mathbf{v}\| = 10.63, \theta = 48.8^\circ$
9.  $\langle 11, 3 \rangle$ ;  $\langle -3, 1 \rangle$
10.  $\langle -4, -5 \rangle$ ;  $\langle -6, 1 \rangle$
11.  $3\mathbf{i} - 2\mathbf{j}$ ;  $-\mathbf{i} + 4\mathbf{j}$
12.  $\mathbf{i}$ ;  $3\mathbf{i} - 2\mathbf{j}$
13. Yes, orthogonal
14. Yes, orthogonal
15. No, parallel
16. No, neither
17.  $\sqrt{34} \text{ cis } 329.04^\circ$
18.  $-2.35 - 3.24i$
19.  $2\sqrt{10} \text{ cis } 161.57^\circ$
20.  $2.96 + 6.34i$
21.  $128.81^\circ$
22.  $\langle 6 \cos(105.95), 6 \sin(105.95) \rangle$   
 $= \langle -1.65, 5.77 \rangle$
23. 46.10 mph,  $44.03^\circ$
24. Speed: 525.79 mph  
Direction:  $186.67^\circ$  or  $W6.67^\circ S$