Warm up

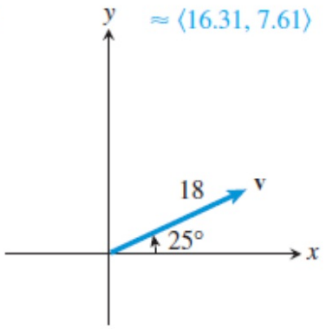
Work on Vector Worksheet #2

#7 - 9

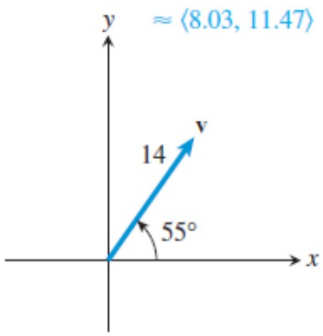
#14 - 22 even

In Exercises 29–32, find the component form of the vector **v**.

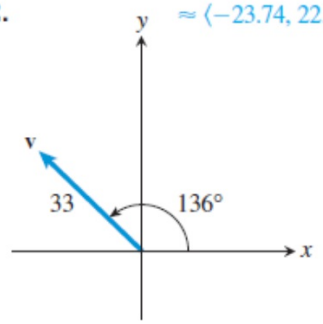
29. $\approx \langle 16.31, 7.61 \rangle$



30. $\approx \langle 8.03, 11.47 \rangle$



32. $\approx \langle -23.74, 22.92 \rangle$



In Exercises 33–38, find the magnitude and direction angle of the vector.

33. $\langle 3, 4 \rangle$ 5; $\approx 53.13°$

34. $\langle -1, 2 \rangle$ $\sqrt{5}$; $\approx 116.57°$

35. $3\mathbf{i} - 4\mathbf{j}$ 5; $\approx 306.87°$

36. $-3\mathbf{i} - 5\mathbf{j}$ $\sqrt{34}$; $\approx 239.04°$

In Exercises 1–8, find the dot product of **u** and **v**.

1. $\mathbf{u} = \langle 5, 3 \rangle$, $\mathbf{v} = \langle 12, 4 \rangle$ 72

2. $\mathbf{u} = \langle -5, 2 \rangle$, $\mathbf{v} = \langle 8, 13 \rangle$ -14

3. $\mathbf{u} = \langle 4, 5 \rangle$, $\mathbf{v} = \langle -3, -7 \rangle$ -47

4. $\mathbf{u} = \langle -2, 7 \rangle$, $\mathbf{v} = \langle -5, -8 \rangle$ -46

5. $\mathbf{u} = -4\mathbf{i} - 9\mathbf{j}$, $\mathbf{v} = -3\mathbf{i} - 2\mathbf{j}$ 30

6. $\mathbf{u} = 2\mathbf{i} - 4\mathbf{j}$, $\mathbf{v} = -8\mathbf{i} + 7\mathbf{j}$ -44

In Exercises 13–22, find the angle θ between the vectors.

13. $\mathbf{u} = \langle -4, -3 \rangle$, $\mathbf{v} = \langle -1, 5 \rangle$ $\approx 115.6°$

14. $\mathbf{u} = \langle 2, -2 \rangle$, $\mathbf{v} = \langle -3, -3 \rangle$ $90°$

15. $\mathbf{u} = \langle 2, 3 \rangle$, $\mathbf{v} = \langle -3, 5 \rangle$ $\approx 64.65°$

16. $\mathbf{u} = \langle 5, 2 \rangle$, $\mathbf{v} = \langle -6, -1 \rangle$ $\approx 167.66°$

17. $\mathbf{u} = 3\mathbf{i} - 3\mathbf{j}$, $\mathbf{v} = -2\mathbf{i} + 2\sqrt{3}\mathbf{j}$ $165°$

18. $\mathbf{u} = -2\mathbf{i}$, $\mathbf{v} = 5\mathbf{j}$ $90°$

22. 153.10°

Add or subtract vectors:

u = <2, 3> v = 3i - 5j w = <-2, -8>

1. 3u - 2w

2. (2v + 3w) - u

3. 4u - v

4. 6w - 2v

5. (5v + u) - 3w

6. (v - w) + 4u

Find the Dot Product

$u = \langle 2, 3 \rangle \quad v = 3i - 5j \quad w = \langle -2, -8 \rangle \quad z = -2i + j$

1. $u \cdot v$
2. $v \cdot w$
3. $z \cdot v$
4. $w \cdot z$
5. $u \cdot z$
6. $w \cdot u$

Find the angle between the two vectors
(Round to tenths)
u = <2, 3> v = 3i - 5j w = <-2, -8> z = <-2i + j

1. u and z

2. v and z

3. w and v

4. w and u

5. u and v

6. w and z

Complete the square...

1) $x^2 - y^2 + 8x - 2y + 9 = 0$

2) $x^2 - y^2 + 14x - 4y - 47 = 0$

3) $x^2 - y^2 + 20x - 8y - 59 = 0$

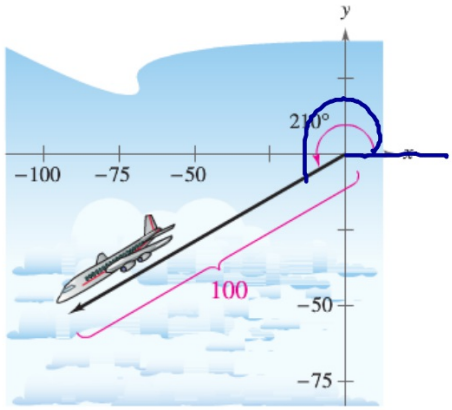
4) $x^2 - y^2 + 12x - 6y - 125 = 0$

5) $x^2 - y^2 + 2x - 16y - 90 = 0$

6) $x^2 - y^2 - 6x - 2y - 125 = 0$

Vector Applications:

Find the component form of the vector that represents the velocity of an airplane descending at a speed of 100 miles per hour at an angle of 30° below the horizontal.

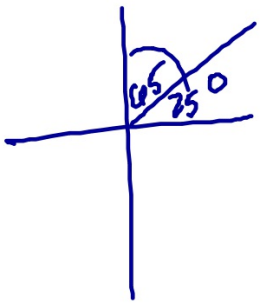


$\langle -86.6, -50 \rangle$

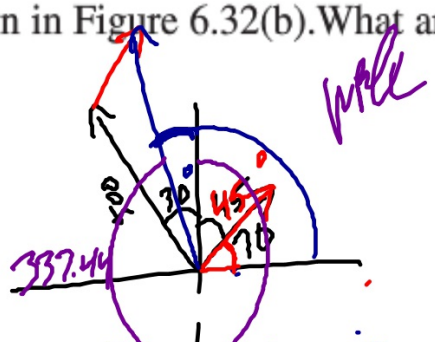
N # E

A DC-10 jet aircraft is flying on a bearing of 65° at 500 mph. Find the component form of the velocity of the airplane. Recall that the bearing is the angle that the line of travel makes with due north, measured clockwise

$\langle 453.15, 211.31 \rangle$



An airplane is traveling at a speed of 500 miles per hour with a bearing of 330° at a fixed altitude with a negligible wind velocity as shown in Figure 6.32(a). When the airplane reaches a certain point, it encounters a wind with a velocity of 70 miles per hour in the direction N 45° E, as shown in Figure 6.32(b).What are the resultant speed and direction of the airplane?



$\langle -250, 433.01 \rangle$

$\langle 49.5, 49.5 \rangle$

$\langle -200.5, 482.51 \rangle$

$-200.5 = 522.5 \cos\theta$

$\theta = 112.54$

22.54

41. Navigation An airplane is flying on a bearing of 335° at 530 mph. Find the component form of the velocity of the airplane. $\approx \langle -223.99, 480.34 \rangle$

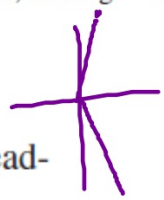
42. Navigation An airplane is flying on a bearing of 170° at 460 mph. Find the component form of the velocity of the airplane. $\approx \langle 79.88, -453.01 \rangle$

43. Flight Engineering An airplane is flying on a compass heading (bearing) of 340° at 325 mph. A wind is blowing with the bearing 320° at 40 mph.

(a) Find the component form of the velocity of the airplane.

(b) Find the actual ground speed and direction of the plane.

43. (a) $\approx \langle -111.16, 305.40 \rangle$ **(b)** $\approx$ 362.85 mph; bearing $\approx$ 337.84°



44. Flight Engineering An airplane is flying on a compass heading (bearing) of 170° at 460 mph. A wind is blowing with the bearing 200° at 80 mph.

(a) Find the component form of the velocity of the airplane.

(b) Find the actual ground speed and direction of the airplane.

44. (a) $\approx \langle 79.88, -453.01 \rangle$

(b) $\approx$ 530.79 mph; bearing $\approx$ 174.32°

Vector Quiz Objectives
Honors Pre-Calculus

6.1 Vectors in the Plane

- Write a set of coordinates, representing the initial point and terminal point of a vector, in component form. (Example 1, #1-4)
- Find the magnitude of a vector. (Example 2, #5-12)
- Combine vectors using addition and scalar multiplication. (Example 3, #13-20)
- Find the unit vector of a vector. (Example 4, #21-28)
- Write vectors both in component form and as a linear combination. (#25-28)
- Find the direction angle of a vector. (Example 6, #33-36)
- Write the component form of a vector given the magnitude and direction angle. (Example 5, #29-32)
- Represent the flight of a plane in vector form given bearings and speed. (Example 7, #41-42)
- Find the ground speed and direction path of a plane given the planes initial flight path and wind direction. (#43-44)

6.2 Dot Product of Vectors

- Find the dot product of two vectors. (Example 1, #1-8)
- Find the angle between two vectors. (Example 3, #13-18, 21-22)
- Determine whether two vectors are orthogonal. (Example 4, #23-24)