Exercise Pages for Section 5.4:

For the following exercises, determine whether the two vectors u and v are equal, where u has an initial point P_1 and a terminal point P_2 and v has an initial point P_3 and a terminal point P_4.

9. $P_1 = (5,1)$, $P_2 = (3,-2)$, $P_3 = (-1,3)$, and $P_4 = (9,-4)$

10. $P_1 = (2,-3)$, $P_2 = (5,1)$, $P_3 = (6,-1)$, and $P_4 = (9,3)$

11. $P_1 = (-1,-1)$, $P_2 = (-4,5)$, $P_3 = (-10,6)$, and $P_4 = (-13,12)$

12. $P_1 = (3,7)$, $P_2 = (2,1)$, $P_3 = (1,2)$, and $P_4 = (-1,-4)$

13. $P_1 = (8,3)$, $P_2 = (6,5)$, $P_3 = (11,8)$, and $P_4 = (9,10)$

14. Given initial point $P_1 = (-3,1)$ and terminal point $P_2 = (5,2)$, write the vector v in terms of i and j.

15. Given initial point $P_1 = (6,0)$ and terminal point $P_2 = (-1,-3)$, write the vector v in terms of i and j.

For the following exercises, use the vectors $\boldsymbol{u} = \boldsymbol{i} + 5\boldsymbol{j}$, $\boldsymbol{v} = -2\boldsymbol{i} - 3\boldsymbol{j}$, and $\boldsymbol{w} = 4\boldsymbol{i} - \boldsymbol{j}$.

16. Find $\boldsymbol{u} + (\boldsymbol{v} - \boldsymbol{w})$

17. Find $4\boldsymbol{v} + 2\boldsymbol{u}$

For the following exercises, use the given vectors to compute $\boldsymbol{u} + \boldsymbol{v}$, $\boldsymbol{u} - \boldsymbol{v}$, and $2\boldsymbol{u} - 3\boldsymbol{v}$.

18. $u = \langle 2,-3 \rangle$, $v = \langle 1,5 \rangle$

19. $u = \langle -3,4 \rangle$, $v = \langle -2,1 \rangle$

20. Let $\boldsymbol{v} = -4\boldsymbol{i} + 3\boldsymbol{j}$. Find a vector that is half the length and points in the same direction as v.

21. Let $\boldsymbol{v} = 5\boldsymbol{i} + 2\boldsymbol{j}$. Find a vector that is twice the length and points in the opposite direction as v.

For the following exercises, find a unit vector in the same direction as the given vector.

22. $\boldsymbol{a} = 3\boldsymbol{i} + 4\boldsymbol{j}$

23. $\boldsymbol{b} = -2\boldsymbol{i} + 5\boldsymbol{j}$

24. $\boldsymbol{c} = 10\boldsymbol{i} - \boldsymbol{j}$

25. $d = -\frac{1}{3}i + \frac{5}{2}j$

26. $\boldsymbol{u} = 100\boldsymbol{i} + 200\boldsymbol{j}$

27. $\boldsymbol{u} = -14\boldsymbol{i} + 2\boldsymbol{j}$

For the following exercises, find the magnitude and direction of the vector, $0 \leq \theta < 2\pi$.

28. $\langle 0,4 \rangle$

29. $\langle 6,5 \rangle$

30. $\langle 2,-5 \rangle$

31. $\langle -4,-6 \rangle$

Graphical

For the following exercises, given v, draw v, $3v$ and $\frac{1}{2}v$.

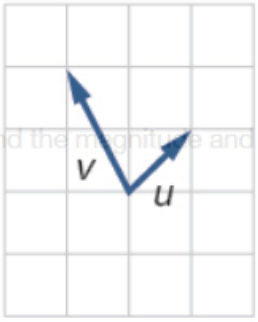
36. $\langle 2, -1 \rangle$

37. $\langle -1, 4 \rangle$

38. $\langle -3, -2 \rangle$

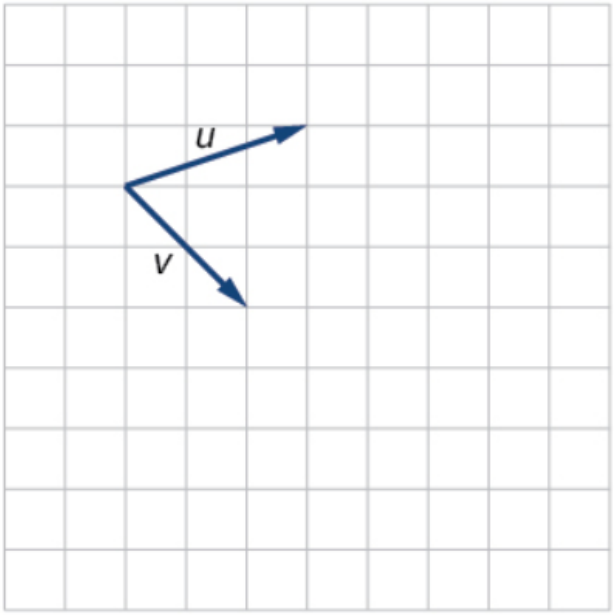
For the following exercises, use the vectors shown to sketch $\boldsymbol{u} + \boldsymbol{v}$, $\boldsymbol{u} - \boldsymbol{v}$, and $2\boldsymbol{u}$.

39.



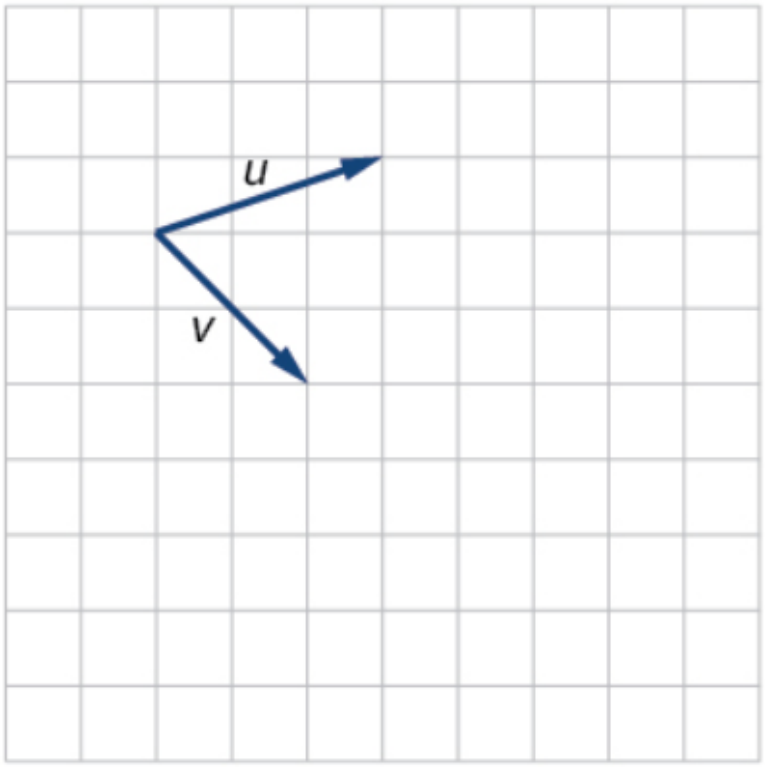
For the following exercises, use the vectors shown to sketch $2\boldsymbol{u} + \boldsymbol{v}$.

42.



For the following exercises, use the vectors shown to sketch $2\boldsymbol{u} + \boldsymbol{v}$.

42.



48. Given initial point $P_1 = (2, 1)$ and terminal point $P_2 = (-1, 2)$, write the vector v in terms of i and j, then draw the vector on the graph.

49. Given initial point $P_1 = (4, -1)$ and terminal point $P_2 = (-3, 2)$, write the vector v in terms of i and j. Draw the points and the vector on the graph.

50. Given initial point $P_1 = (3, 3)$ and terminal point $P_2 = (-3, 3)$, write the vector v in terms of i and j. Draw the points and the vector on the graph.

For the following exercises, use the given magnitude and direction in standard position, write the vector in component form.

51. $|v| = 6, \theta = 45^\circ$

52. $|v| = 8, \theta = 220^\circ$

53. $|v| = 2, \theta = 300^\circ$

54. $|v| = 5, \theta = 135^\circ$

55. A 60-pound box is resting on a ramp that is inclined 12°. Rounding to the nearest tenth,
    a. Find the magnitude of the normal (perpendicular) component of the force.
    b. Find the magnitude of the component of the force that is parallel to the ramp.

56. A 25-pound box is resting on a ramp that is inclined 8°. Rounding to the nearest tenth,
    a. Find the magnitude of the normal (perpendicular) component of the force.
    b. Find the magnitude of the component of the force that is parallel to the ramp.

57. Find the magnitude of the horizontal and vertical components of a vector with magnitude 8 pounds pointed in a direction of 27° above the horizontal. Round to the nearest hundredth.

58. Find the magnitude of the horizontal and vertical components of the vector with magnitude 4 pounds pointed in a direction of 127° above the horizontal. Round to the nearest hundredth.

59. Find the magnitude of the horizontal and vertical components of a vector with magnitude 5 pounds pointed in a direction of 55° above the horizontal. Round to the nearest hundredth.

63. A man starts walking from home and walks 4 miles east, 2 miles southeast, 5 miles south, 4 miles southwest, and 2 miles east. How far has he walked? If he walked straight home, how far would he have to walk?

64. A woman starts walking from home and walks 4 miles east, 7 miles southeast, 6 miles south, 5 miles southwest, and 3 miles east. How far has she walked? If she walked straight home, how far would she have to walk?

65. A man starts walking from home and walks 3 miles at 20° north of west, then 5 miles at 10° west of south, then 4 miles at 15° north of east. If he walked straight home, how far would he have to the walk, and in what direction?

66. A woman starts walking from home and walks 6 miles at 40° north of east, then 2 miles at 15° east of south, then 5 miles at 30° south of west. If she walked straight home, how far would she have to walk, and in what direction?