For problems 1-6, draw the vectors and the resultant vector.
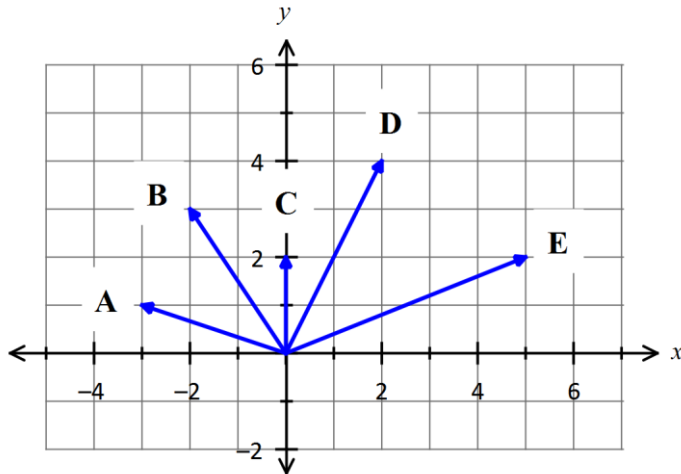
1. $\mathbf{A}+\mathbf{B}$

2. $\mathbf{B}-\mathbf{C}$

3. $\mathbf{C}+\mathbf{D}$

4. $\mathbf{A}+\mathbf{E}$

5. $\mathbf{D}-\mathbf{B}$

6. $-\mathbf{A}+(-\mathbf{C})+\mathbf{D}$

Find the component form of each vector with the given magnitude and direction. If possible, give exact values using radicals. Otherwise round to the nearest tenth.

7. $|\mathbf{v}|=8,\ \theta=30°$

8. $|\mathbf{v}|=15,\ \theta=135°$

9. $|\mathbf{v}|=22,\ \theta=270°$

10. $|\mathbf{v}|=8\sqrt{2},\ \theta=315°$

11. $|\mathbf{v}|=3.2,\ \theta=321°$

12. $|\mathbf{v}|=85,\ \theta=193°$

Find the magnitude and direction angle of each vector. Give exact values for the magnitude. Round the direction angle to the nearest tenth of a degree, if necessary.

13. $\langle \sqrt{3}, 1 \rangle$

14. $\langle -\sqrt{2}, \sqrt{2} \rangle$

15. $\langle 10, -10\sqrt{3} \rangle$

16. $\langle -7, 0 \rangle$

17. $\langle -8, -8 \rangle$

18. $\langle -3, 4 \rangle$

19. $\langle -4, -2 \rangle$

20. $\langle 2, -6 \rangle$

Let $r = \langle 3, -2 \rangle$, $s = \langle -1, 5 \rangle$, **and** $t = \langle 4, -6 \rangle$. **Perform the operations indicated. Write vector answers in component form.**

21. $-4s$

22. $2r + 3t$

23. $\dfrac{r + s}{2}$

24. $r - (s + t)$

25. $r \cdot s$

26. $s \cdot t$

Find the smallest positive angle to the nearest tenth of a degree between each given pair of vectors.

27. $\langle 2, 1 \rangle$, $\langle 3, 5 \rangle$

28. $\langle -2, -3 \rangle$, $\langle 7, 1 \rangle$

29. $\langle -6, 5 \rangle$, $\langle 5, 6 \rangle$

Determine whether each pair of vectors is parallel, perpendicular, or neither.

30. $\langle -2, 3 \rangle$, $\langle 6, 4 \rangle$

31. $\langle 3, 5 \rangle$, $\langle -5, -3 \rangle$

32. $\langle 2, -4 \rangle$, $\langle 2, 1 \rangle$

33. $\langle 1, 7 \rangle$, $\langle -2, -14 \rangle$

Given that $A = \langle 3,1 \rangle$ and $B = \langle -2,3 \rangle$, find the magnitude and direction angle for each of the following vectors. Give exact answers using radicals when possible. Otherwise round to the nearest tenth.
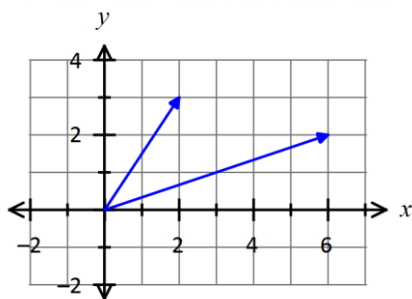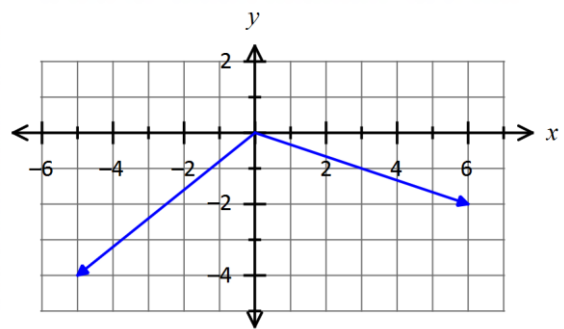
34. $A - B$ 35. $5A$ 36. $-A + 3B$

For each given pair of vectors, find the magnitude and direction angle of the resultant. Give exact answers using radicals when possible. Otherwise round to the nearest tenth.

37.

38.

Write each vector as a linear combination of the unit vectors i and j.

39. $\langle 1,1 \rangle$ 40. $\langle -3, \sqrt{2} \rangle$ 41. $\langle 0,-8 \rangle$ 42. $\langle -3,-1 \rangle$