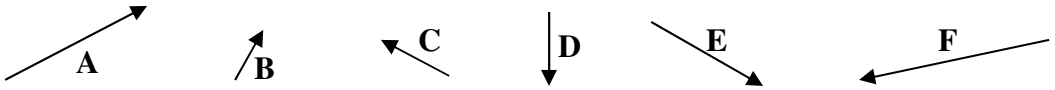
Precalculus – Unit 7 Review

Add the vectors graphically as accurately as possible. (Trace them on your paper to try to preserve their magnitudes and direction angles).



1. $\mathbf{D}+\mathbf{E}$
2. $\mathbf{D}-\mathbf{B}$
3. $\mathbf{A}+\mathbf{F}$
4. $\mathbf{B}-\mathbf{C}$
5. $\mathbf{E}+\mathbf{F}$
6. $\mathbf{C}-\mathbf{A}$

Find the component form of the vector with the given magnitude and direction angle.

7. $|\mathbf{v}|=5\sqrt{2},\ \theta=315°$
8. $|\mathbf{v}|=8,\ \theta=\frac{5\pi}{6}$
9. $|\mathbf{v}|=27.3,\ \theta=214.9°$

Find the magnitude and direction angle of the vector. Give the measure of the direction angle as an angle in $[0°, 360°)$.

10. $\langle 8,-8\sqrt{3}\rangle$
11. $\langle 3,3\rangle$
12. $\langle 4,-6\rangle$

Perform the indicated operation. Use the form $\langle a,b\rangle$ for vectors. $\mathbf{u}=\langle -1,5\rangle,\ \mathbf{v}=\langle 4,-7\rangle$

13. Find $3\mathbf{u}-\mathbf{v}$
14. Find $\mathbf{u}\cdot\mathbf{v}$

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

15. $\langle -1,5\rangle$ and $\langle 2,7\rangle$
16. $\langle -6,8\rangle$ and $\langle 5,-1\rangle$

Determine whether the vectors are parallel, perpendicular, or neither.

17. $\langle 2,-4\rangle$ and $\langle 6,3\rangle$
18. $\langle 9,1\rangle$ and $\langle 1,9\rangle$
19. $\langle -1,7\rangle$ and $\langle 3,-21\rangle$

Solve the problems.

20. One rope pulls a barge due east with a force of 75 N, and another rope pulls the barge due south with a force of 87 N. Find the magnitude of the resultant force acting on the barge and the angle between the resultant force and the smaller force.

21. The resultant of an 18-lb force and another force has a magnitude of 12 lbs and makes an angle of 40° with the 18-lb force. Find the magnitude of the other force and the angle between the two original forces.

22. Find the force required to keep a 50-lb wagon from sliding down a ramp inclined at 20° to the horizontal.

23. It takes 30 lbs of force to push a crate up a ramp that is inclined 18°. How much does the crate weigh?

24. It takes 16 lbs of force to push a 40-lb lawnmower up a hill. Find the angle of incline of the hill.

25. An airplane flies due east at 375 mph. The wind affecting the plane is blowing <u>from</u> 295° at 43 mph. What is the true course and ground speed of the airplane? Round to the nearest tenth.

26. A plane is flying with a heading of S68°W and an air speed of 425 mph. It encounters a wind blowing at 36 mph from a direction of S65°E. Find the resulting bearing and ground speed of the plane.

Write the complex number in trigonometric form, using radian measure for the argument. Give exact magnitudes. If necessary, round the argument to the nearest hundredth.

27. $-2\sqrt{3}-2i$ 28. $16\sqrt{2}-16i\sqrt{2}$ 29. $6-3i$

Write the complex number in the form $a+bi$.

30. $9(\cos 240^\circ + i\sin 240^\circ)$ 31. $24\,\mathrm{cis}(3\pi/4)$ 32. $\sqrt{15}\,\mathrm{cis}(312.8^\circ)$

Perform the indicated operation. Write the answer in the form $a+bi$.

33. $4(\cos 80^\circ + i\sin 80^\circ)\cdot 3(\cos 130^\circ + i\sin 130^\circ)$ 34. $\dfrac{7\left(\cos\frac{5\pi}{6}+i\sin\frac{5\pi}{6}\right)}{2\left(\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}\right)}$

Use De Moivre's Theorem to simplify the expression. Write the answer in $a+bi$ form.

35. $\left[2(\cos 225^\circ + i\sin 225^\circ)\right]^7$ 36. $\left(-4+4i\sqrt{3}\right)^4$ 37. $(2-2i)^5$

Find the indicated roots. Write the answers in trigonometric form.

38. Fourth roots of $81(\cos 280^\circ + i\sin 280^\circ)$ 39. Fifth roots of $32i$

Solve the equation. Write the answer in $a+bi$ form. Give exact answers (no calculator).

40. $x^3+64=0$ 41. $x^2+18i=0$

Convert the rectangular coordinates to polar coordinates, using radian measure for the angle.

42. $(-5,-5)$ 43. $(-4,0)$ 44. $\left(2\sqrt{3},-2\right)$

Plot the point whose polar coordinates are given.

45. $\left(2,-\dfrac{2\pi}{3}\right)$ 46. $\left(4,\dfrac{5\pi}{6}\right)$ 47. $(-3,210^\circ)$

Convert to rectangular coordinates.

48. $\left(-2,\dfrac{3\pi}{4}\right)$ 49. $\left(3,-\dfrac{1}{2}\pi\right)$ 50. $\left(-4,\dfrac{4\pi}{3}\right)$

Graph the polar equation.

51. $r=7$ 52. $r=-6\sin\theta$ 53. $r=3-3\cos\theta$
54. $r^2=4\sin(2\theta)$ 55. $r=3+6\sin\theta$ 56. $r=4\sin(3\theta)$
57. $r=5-2\sin\theta$ 58. $r=5\cos(4\theta)$

For the given polar equation, write an equivalent rectangular equation.

59. $r=7$ 60. $r=5\cos\theta$ 61. $r=7\csc\theta$

For the given rectangular equation, write an equivalent polar equation.

62. $x^2 + y^2 = 64$

63. $x = 5$

64. $x^2 + y^2 + 5y = 0$

Graph the pair of parametric equations in the rectangular coordinate system.

65. $x = -2t + 5,\ y = 4t;\ -1 \le t \le 2$

66. $x = 3t + 4,\ y = t^2 - 7;\ -4 \le t \le 4$

Eliminate the parameter of the pair of parametric equations.

67. $x = 8t,\ y = 4t + 9$

68. $x = t + 5,\ y = t^2 + 3$

69. $x = 4\cos\theta,\ y = \sin\theta$

Write a pair of parametric equations for the given polar equation.

70. $r = -3\cos^2\theta$

Write a pair of parametric equations that will produce the indicated graph.

71. The line segment starting at $(1,-2)$ with $t = 0$ and ending at $(13,1)$ with $t = 3$.

72. The line segment starting at $(2,5)$ with $t = 3$ and ending at $(-10,13)$ with $t = 7$.