CHAPTER 10 REVIEW EXERCISES

Section 10.1

Create a triangle, if possible, using the given information.

1. $A = 30°,\ B = 45°,\ b = 4$

2. $a = 15,\ c = 13,\ C = 57°$

3. $A = 74°20',\ C = 37°,\ c = 23$

4. $b = 8,\ c = 13,\ C = 78°$

5. Find the area of a triangle for which $a = 3$, $b = 7$, and $C = 75°$.

Section 10.2

Create a triangle, if possible, using the given information and the Law of Cosines.

6. $A = 62°,\ b = 8,\ c = 10$

7. $B = 94°\ 7',\ a = 6,\ c = 14$

8. $a = 9,\ b = 2.5,\ c = 7.3$

9. $a = 10.8,\ b = 13.4,\ c = 6$

10. The base of a 25 ft ladder is positioned 7 ft away from an office building situated on a slight hill, and the ladder and ground form a 62° angle. At what angle and at what height does the ladder touch the building?

11. Find the area of a triangle for which $a = 5$, $b = 11$, and $c = 9$.

Section 10.3

Convert the point from polar to Cartesian coordinates.

12. $\left(-3.45, \frac{\pi}{3}\right)$

13. $\left(7, \frac{7\pi}{6}\right)$

Convert the point from Cartesian to polar coordinates.

14. $\left(-\sqrt{3}, -1\right)$

15. $(10, 12)$

Rewrite the rectangular equation in polar form.

16. $x^2 + y^2 = 16a^2$

17. $x^2 + y^2 = 9ax$

Rewrite the polar equation in rectangular form.

18. $r = 2\cos\theta$

19. $r = \dfrac{16}{4\cos\theta + 4\sin\theta}$

Sketch a graph of the given polar equation.

20. $r = 4\sin(3\theta)$

21. $r^2 = 25\cos(2\theta)$

Section 10.4

Sketch the graphs of the following parametric equations by eliminating the parameter.

22. $x = \dfrac{1}{36t}$ and $y = t^2$

23. $x = t + 5$ and $y = |t - 2|$

24. $x = \dfrac{3}{4t - 2}$ and $y = 2t - 2$

25. $x = 4\sin\theta$ and $y = \cos\theta + 1$

Construct parametric equations describing the graphs of the following equations.

26. $y^2 = x^2 + 4$

27. $6x = 2 - y$

Construct parametric equations for the line or conic with the given attributes.

28. Line: passing through $(14, 4)$ and $(-3, -8)$

29. Circle: center $(1,1)$, radius 1

Section 10.5

Graph and determine the magnitudes of the following complex numbers.

30. $4 + 5i$

31. $-3 + 3i$

Sketch z_1, z_2, $z_1 + z_2$, and $z_1 z_2$ on the same complex plane.

32. $z_1 = -2 - 3i, z_2 = 6 + 3i$

33. $z_1 = 4 + 2i, z_2 = -5 + i$

Graph the regions of the complex plane defined by the following.

34. $\{z \mid 2 \le |z| \le 3\}$

35. $\{z = a + bi \mid a > 2, b > 3\}$

Write each of the following complex numbers in trigonometric form.

36. $2\sqrt{3} - 3i$

37. $1 + 4i$

Write each of the following complex numbers in standard form.

38. $4\left(\cos\left(\dfrac{7\pi}{4}\right) + i\sin\left(\dfrac{7\pi}{4}\right)\right)$

39. $3(\cos 60° + i\sin 60°)$

Perform the following operations and show the answer in both trigonometric form and standard form.

40. $\left[\sqrt{3}\left(\cos\left(\dfrac{2\pi}{3}\right) + i\sin\left(\dfrac{2\pi}{3}\right)\right)\right]\left[4\sqrt{3}\left(\cos\left(\dfrac{7\pi}{6}\right) + i\sin\left(\dfrac{7\pi}{6}\right)\right)\right]$

41. $\dfrac{5(\cos 240° + i\sin 240°)}{(\cos 120° + i\sin 120°)}$

42. $\dfrac{-\sqrt{3} + i}{1 - i\sqrt{3}}$

43. $\left(12e^{35°i}\right)\left(2e^{280°i}\right)$

Use De Moivre's Theorem to calculate the following.

44. $\left(1+\sqrt{3}i\right)^6$

45. $\left[3\left(\cos 240^\circ + i\sin 240^\circ\right)\right]^{11}$

Find the indicated roots of the following and graphically represent each set in the complex plane.

46. The square roots of $-144i$.

47. The cube roots of $125\left(\cos\left(\frac{7\pi}{4}\right)+i\sin\left(\frac{7\pi}{4}\right)\right)$.

Solve the following equations.

48. $z^4 - 1 + i = 0$

49. $z^3 + 4\sqrt{2} - 4i\sqrt{2} = 0$

Section 10.6

Find the component form and the magnitude of a vector **v** defined by the given points. Assume the first point given is the initial point and the second point given is the terminal point.

50. $(-1, 0), (4, -5)$

51. $(6, 5), (-4, -1)$

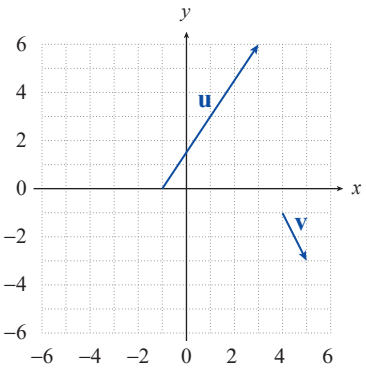
For each of the following, calculate and graph **a.** $2\mathbf{u} + \mathbf{v}$, **b.** $-\mathbf{u} + 3\mathbf{v}$, and **c.** $-2\mathbf{v}$.

52. $\mathbf{u} = \langle 1, 3\rangle$, $\mathbf{v} = \langle -5, 2\rangle$

53. $\mathbf{u} = \langle 1, -1\rangle$, $\mathbf{v} = \langle 4, -3\rangle$

For each of the following graphs, determine the component forms of $-\mathbf{u}$, $2\mathbf{u} - \mathbf{v}$, and $\mathbf{u} + \mathbf{v}$ and find the magnitudes of **u** and **v**.

54.



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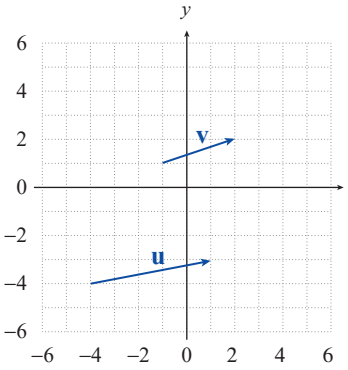

Given the vector **u**, find **a.** a unit vector pointing in the same direction as **u**, and **b.** the linear combination of **i** and **j** that is equivalent to **u**.

56. $\mathbf{u} = \langle -4, 5\rangle$

57. $\mathbf{u} = \langle 6, 3\rangle$

Find the magnitude and direction angle of the vector **v**.

58. $\mathbf{v} = 4\left(\cos 135^\circ \mathbf{i} + \sin 135^\circ \mathbf{j}\right)$

59. $\mathbf{v} = 5\mathbf{i} - \mathbf{j}$

Find the component form of **v** given its magnitude and the angle it makes with the positive *x*-axis.

60. $\|\mathbf{v}\| = 2\sqrt{2},\ \theta = 60°$

61. $\|\mathbf{v}\| = 6,$ **v** in the direction of $3\mathbf{i} - 4\mathbf{j}$

62. A golf ball is driven into the air at a speed of 90 miles per hour and an angle of 45° from the horizontal. Express this velocity in vector form.

63. A sailboat is traveling at a speed of 55 miles per hour with a bearing of N 24° W, when it encounters a front with winds blowing at 20 miles per hour with a bearing of S 10° W. What is the resultant true velocity of the sailboat?

Section 10.7

Find the indicated quantity given $\mathbf{u} = \langle 1, -4 \rangle$ and $\mathbf{v} = \langle 2, 5 \rangle$.

64. $3\mathbf{u} \cdot \mathbf{v}$

65. $(\mathbf{u} \cdot \mathbf{v})3\mathbf{v}$

Find the magnitude of **u** using the dot product.

66. $\mathbf{u} = \langle -2, -3 \rangle$

67. $\mathbf{u} = -\mathbf{i} - 3\mathbf{j}$

Find the angle between the given vectors.

68. $\mathbf{u} = \langle 5, -5 \rangle,\ \mathbf{v} = \langle 1, 4 \rangle$

69. $\mathbf{u} = \cos\left(\frac{\pi}{4}\right)\mathbf{i} + \sin\left(\frac{\pi}{4}\right)\mathbf{j},\ \mathbf{v} = \cos\left(\frac{2\pi}{3}\right)\mathbf{i} + \sin\left(\frac{2\pi}{3}\right)\mathbf{j}$

Find $\mathbf{u} \cdot \mathbf{v}$ where θ is the angle between **u** and **v**.

70. $\|\mathbf{u}\| = 16,\ \|\mathbf{v}\| = 2,\ \theta = 60°$

71. $\|\mathbf{u}\| = 8,\ \|\mathbf{v}\| = 9,\ \theta = \frac{2\pi}{3}$

Find the projection of **u** onto **v**, and then write **u** as a sum of two orthogonal vectors, one of which is $\text{proj}_{\mathbf{v}}\mathbf{u}$.

72. $\mathbf{u} = \langle 2, 3 \rangle,\ \mathbf{v} = \langle -1, 5 \rangle$

73. $\mathbf{u} = \langle 4, -1 \rangle,\ \mathbf{v} = \langle 2, 2 \rangle$

Find the work done in a particle moving from *J* to *K* if the magnitude and direction of the force are given by **F**.

74. $J = (2, 4),\ K = (3, 6),\ \mathbf{F} = \langle 1, 3 \rangle$

75. $J = (-5, 3),\ K = (0, 4),\ \mathbf{F} = \langle 5, 6 \rangle$

76. A truck with a gross weight of 33,000 pounds is parked on a 6° slope. What force is required to prevent the truck from rolling down the hill?

77. The world's strongest man pulls a log 160 feet, and the tension in the cable connecting the man and log is 2650 pounds. What is the work being done if the cable is being held 10° from the horizontal?

Section 10.8

Evaluate each of the following expressions. Round your answers to two decimal places if necessary.

78. $\cosh(\ln 2)$

79. $\sinh(\ln 4)$

80. $\operatorname{sech}(-2)$

81. $\coth 1$

82. Verify the identity $\cosh x + \cosh y = 2\cosh\left(\frac{x+y}{2}\right)\cosh\left(\frac{x-y}{2}\right)$.