

In Exercises 7–10, let $A = (2, -1)$, $B = (3, 1)$, $C = (-4, 2)$, and $D = (1, -5)$. Find the component form and magnitude of the vector.

8. $\overrightarrow{AB} + \overrightarrow{CD}$

In Exercises 11 and 12, find (a) a unit vector in the direction of \overrightarrow{AB} and (b) a vector of magnitude 3 in the opposite direction.

11. $A = (4, 0)$, $B = (2, 1)$

In Exercises 13 and 14, find (a) the direction angles of \mathbf{u} and \mathbf{v} and (b) the angle between \mathbf{u} and \mathbf{v} .

14. $\mathbf{u} = \langle -2, 4 \rangle$, $\mathbf{v} = \langle 6, 4 \rangle$

In Exercises 15–18, convert the polar coordinates to rectangular coordinates.

15. $(-2.5, 25^\circ)$

17. $(2, -\pi/4)$

18. $(3.6, 3\pi/4)$

In Exercises 21–24, rectangular coordinates of point P are given. Find polar coordinates of P that satisfy these conditions:

(a) $0 \leq \theta \leq 2\pi$ (b) $-\pi \leq \theta \leq \pi$ (c) $0 \leq \theta \leq 4\pi$

21. $P = (2, -3)$

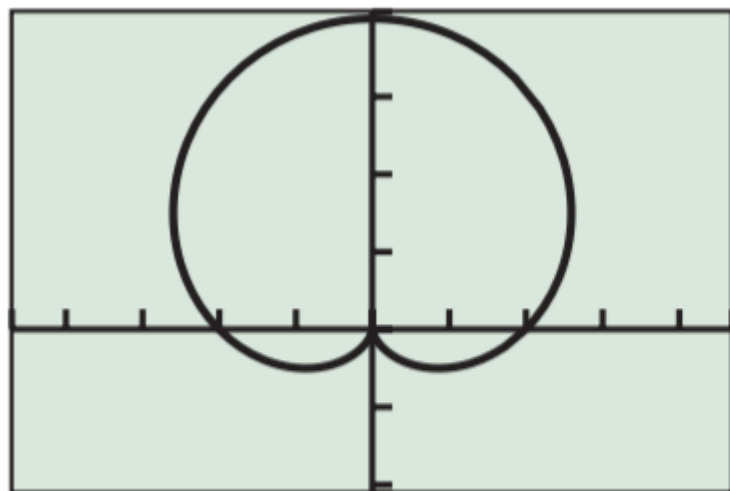
In Exercises 53–60, decide whether the graph of the given polar equation appears among the four graphs shown.

53. $r = 3 \sin 4\theta$

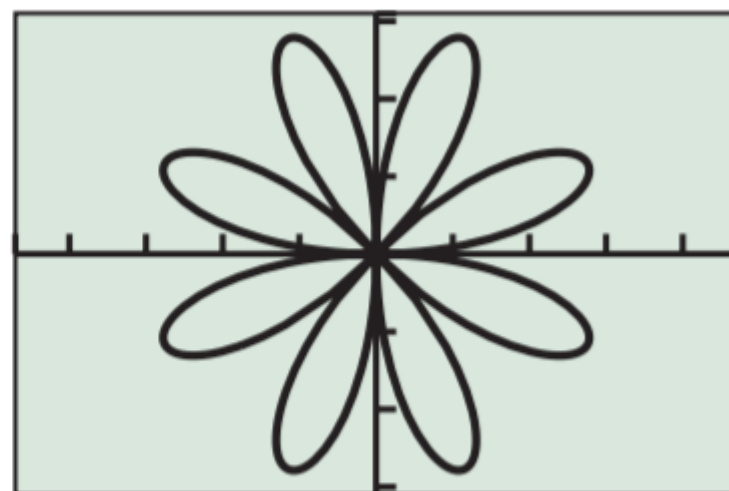
55. $r = 2 + 2 \sin \theta$

57. $r = 2 - 2 \sin \theta$

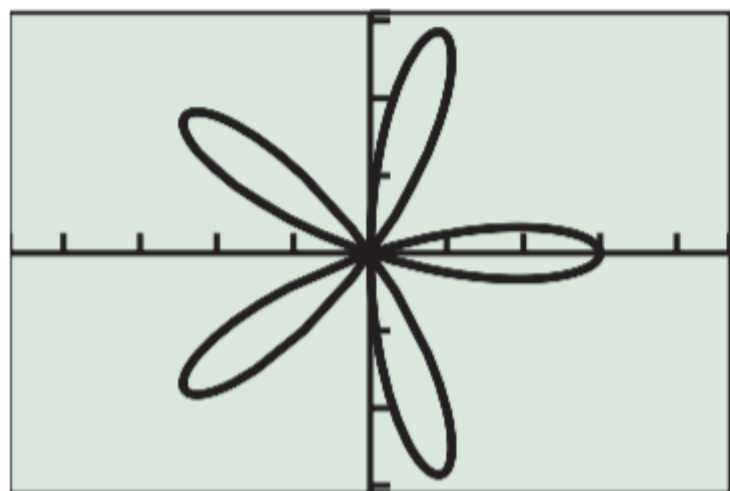
59. $r = 3 \cos 5\theta$



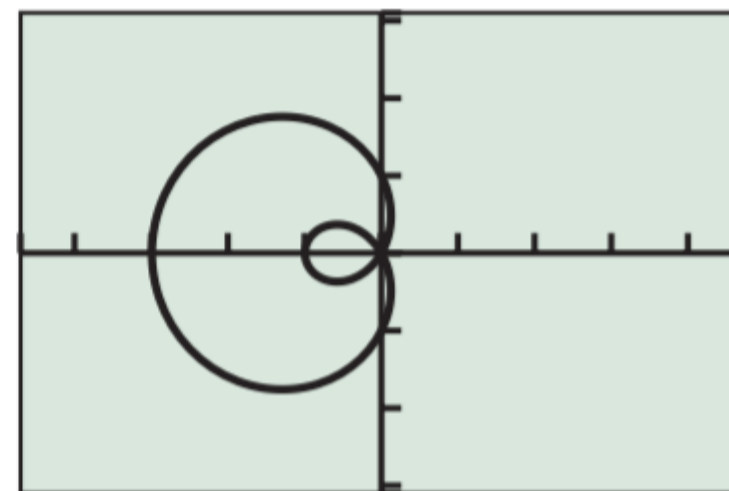
(a)



(b)



(c)



(d)

54. $r = 2 + \sin \theta$

56. $r = 3 |\sin 3\theta|$

58. $r = 1 - 2 \cos \theta$

60. $r = 3 - 2 \tan \theta$

In Exercises 25–30, eliminate the parameter t and identify the graph.

25. $x = 3 - 5t, y = 4 + 3t$

27. $x = 2t^2 + 3, y = t - 1$

In Exercises 61–64, convert the polar equation to rectangular form and identify the graph.

62. $r = -2 \sin \theta$

64. $r = 3 \sec \theta$

In Exercises 65–68, convert the rectangular equation to polar form. Graph the polar equation.

65. $y = -4$

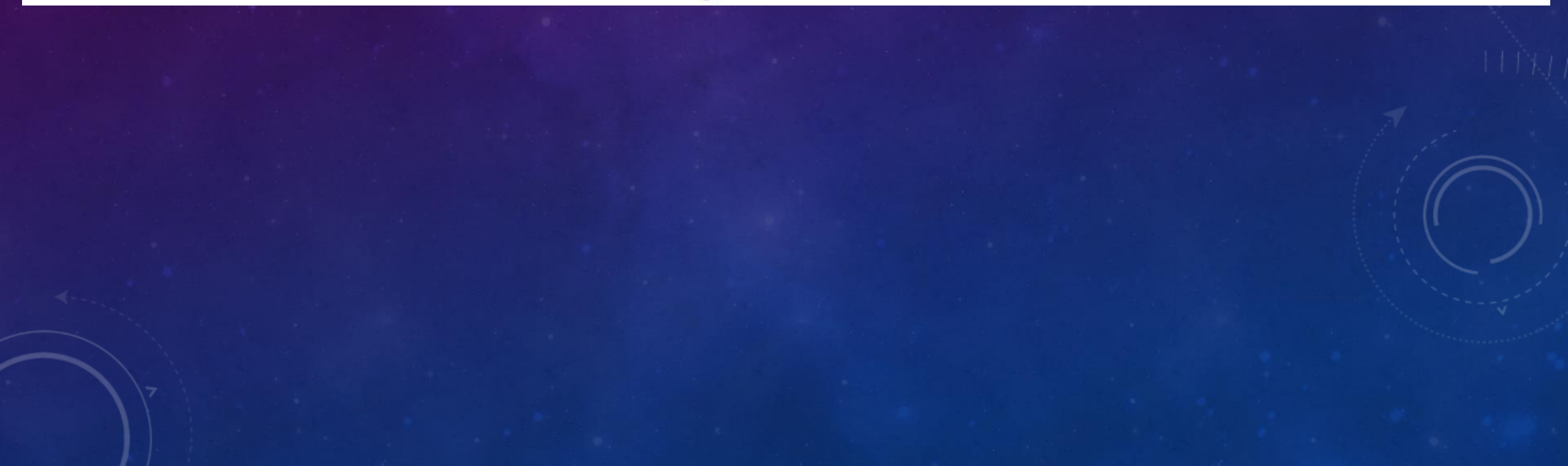
67. $(x - 3)^2 + (y + 1)^2 = 10$

74. Flight Engineering An airplane is flying on a bearing of 80° at 540 mph. A wind is blowing with the bearing 100° at 55 mph.

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

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

81. Ferris Wheel Problem The lowest point of a Ferris wheel (6 o'clock) of radius 40 ft is 10 ft above the ground, and the center is on the y -axis. Find parametric equations for Henry's position as a function of time t in seconds if his starting position ($t = 0$) is the point $(0, 10)$ and the wheel turns at the rate of one revolution every 15 sec.



86. Field Goal Kicking Spencer practices kicking field goals 40 yd from a goal post with a crossbar 10 ft high. If he kicks the ball with an initial velocity of 70 ft/sec at a 45° angle with the horizontal (see figure), will Spencer make the field goal if the kick sails “true”?

