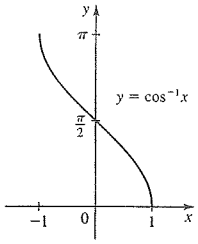
10. $2\cos\frac{7x}{2}\cos\frac{x}{2}$ **11.** **(a)** Domain $[-1, 1]$, range $[0, \pi]$



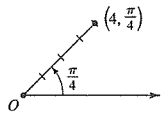
(b) $5\pi/6$ **(c)** $\sqrt{1-x^2}/x$ **12.** $\pi/6, 5\pi/6, 3\pi/2$

CHAPTER 8

SECTION 8.1 ■ PAGE 546

1. coordinate; $(1, 1), (\sqrt{2}, \pi/4)$ **2.** **(a)** $r\cos\theta, r\sin\theta$ **(b)** $x^2 + y^2, y/x$

3.



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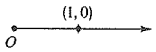

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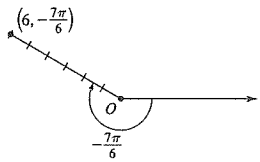

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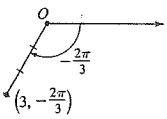

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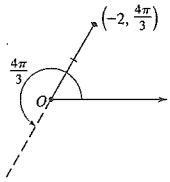

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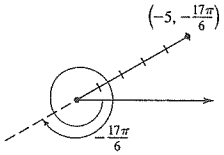

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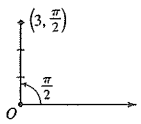
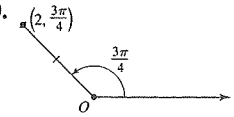


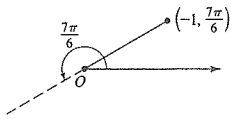
$\left(-3, \frac{3\pi}{2}\right), \left(3, \frac{5\pi}{2}\right)$

10.



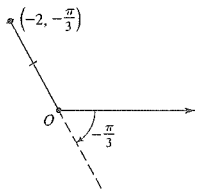
$\left(-2, \frac{7\pi}{4}\right), \left(2, \frac{11\pi}{4}\right)$

11.



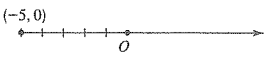
$\left(-1, -\frac{5\pi}{6}\right), \left(1, \frac{\pi}{6}\right)$

12.



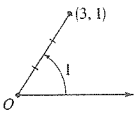
$\left(-2, \frac{5\pi}{3}\right), \left(2, \frac{2\pi}{3}\right)$

13.



$(-5, 2\pi), (5, \pi)$

14.



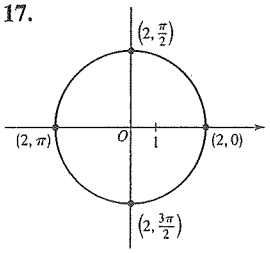
$(3, 1 + 2\pi), (-3, 1 + \pi)$

15. Q **16.** R **17.** Q **18.** P **19.** P **20.** Q **21.** P
22. S **23.** $(3\sqrt{2}, 3\pi/4)$ **24.** $(3, 3\pi/2)$
25. $\left(-\frac{5}{2}, -\frac{5\sqrt{3}}{2}\right)$ **26.** $\left(\frac{-3\sqrt{3}}{2}, 1\right)$ **27.** $(2\sqrt{3}, 2)$
28. $(-3, 3\sqrt{3})$ **29.** $(1, -1)$ **30.** $(0, -1)$ **31.** $(-5, 0)$
32. $(0, 0)$ **33.** $(3\sqrt{6}, -3\sqrt{2})$ **34.** $(\sqrt{3}/2, \frac{3}{2})$
35. $(\sqrt{2}, 3\pi/4)$ **36.** $(6, 11\pi/6)$ **37.** $(4, \pi/4)$
38. $(2\sqrt{2}, 7\pi/6)$ **39.** $(5, \tan^{-1}\frac{4}{3})$
40. $(\sqrt{5}, 2\pi + \tan^{-1}(-2))$ **41.** $(6, \pi)$ **42.** $(\sqrt{3}, 3\pi/2)$
43. $\theta = \pi/4$ **44.** $r = 3$ **45.** $r = \tan\theta\sec\theta$
46. $r = 5\csc\theta$ **47.** $r = 4\sec\theta$ **48.** $r^2 = \sec 2\theta$
49. $x^2 + y^2 = 49$ **50.** $x^2 + y^2 = 9$ **51.** $x = 0$ **52.** $y = 0$
53. $x = 6$ **54.** $y = 2$ **55.** $x^2 + (y-2)^2 = 4$
56. $(x-3)^2 + y^2 = 9$ **57.** $x^2 + y^2 = (x^2 + y^2 - x)^2$
58. $(x^2 + y^2 + 3y)^2 = 9(x^2 + y^2)$
59. $(x^2 + y^2 - 2y)^2 = x^2 + y^2$
60. $(x^2 + y^2 - x)^2 = 4(x^2 + y^2)$ **61.** $y - x = 1$
62. $x^2 + 2y - 1 = 0$ **63.** $x^2 - 3y^2 + 16y - 16 = 0$
64. $y^2 = 4x + 4$ **65.** $x^2 + y^2 = \frac{y}{x}$
66. $x^4 + 2x^2y^2 + y^4 - 2xy = 0$
67. $y = \pm\sqrt{3}x$ **68.** $y = 0$

SECTION 8.2 ■ PAGE 553

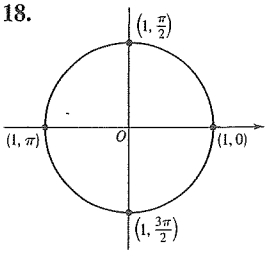
1. circles, rays **2.** **(a)** satisfy **(b)** circle, 3, pole; line, pole, 1
3. VI **4.** III **5.** II **6.** IV **7.** I **8.** V
9. Symmetric about $\theta = \pi/2$
10. Symmetric about the polar axis
11. Symmetric about the polar axis
12. Symmetric about the pole
13. Symmetric about $\theta = \pi/2$
14. Symmetric about the polar axis
15. All three types of symmetry
16. Symmetric about the pole and about $\theta = \pi/2$

17.



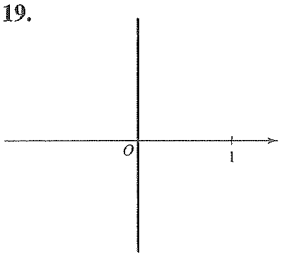
$x^2 + y^2 = 4$

18.



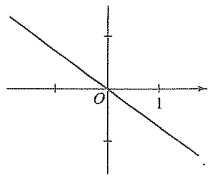
$x^2 + y^2 = 1$

19.



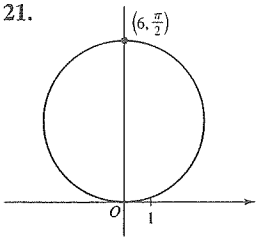
$x = 0$

20.



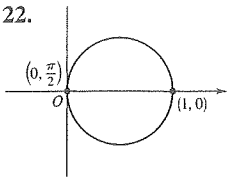
$y = -\frac{\sqrt{3}}{3}x$

21.



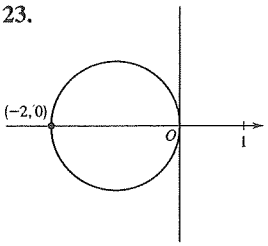
$x^2 + (y - 3)^2 = 9$

22.



$(x - \frac{1}{2})^2 + y^2 = \frac{1}{4}$

23.



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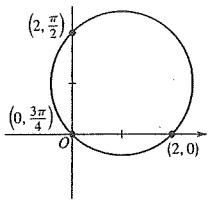

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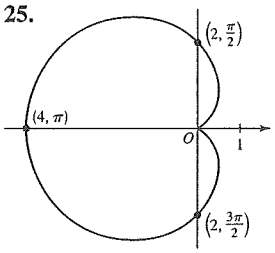

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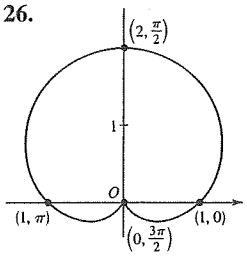

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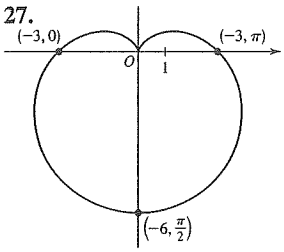

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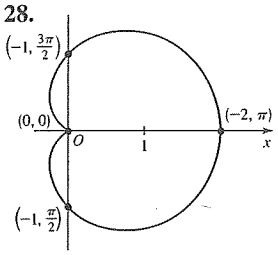

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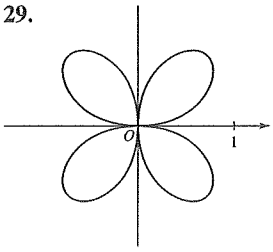

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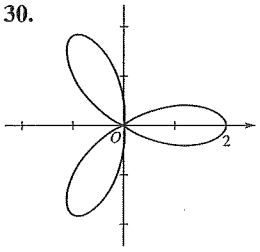

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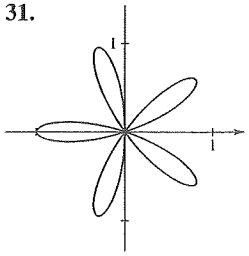

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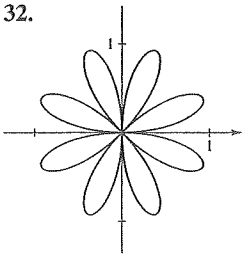

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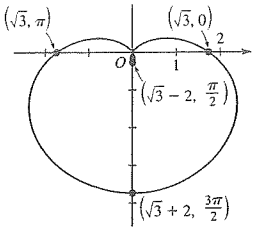

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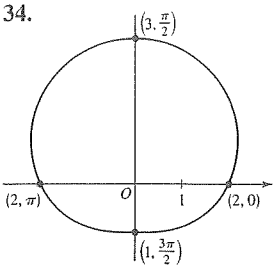

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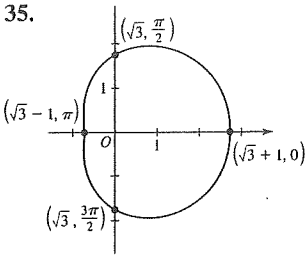

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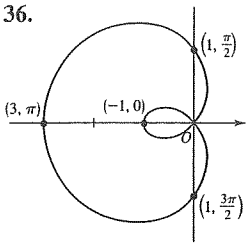

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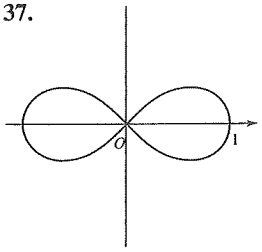

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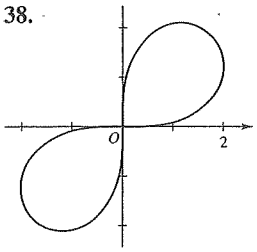

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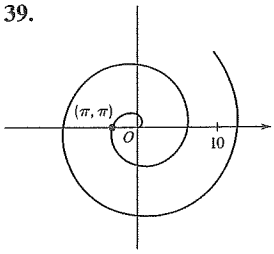

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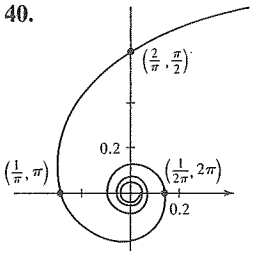

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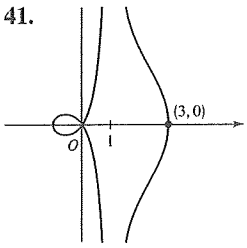

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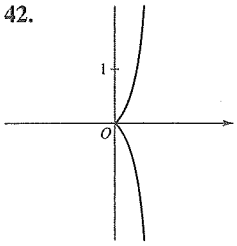
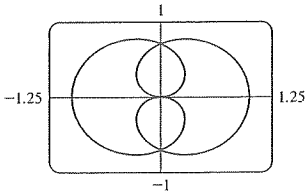
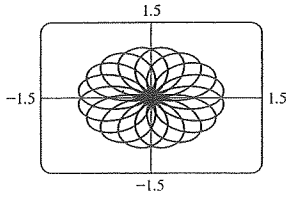


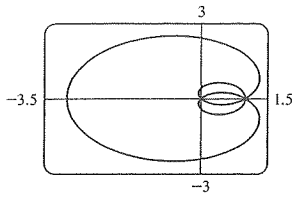
43. $0 \le \theta \le 4\pi$



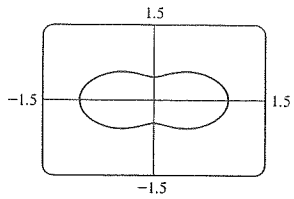
44. $0 \le \theta \le 10\pi$



45. $0 \le \theta \le 4\pi$



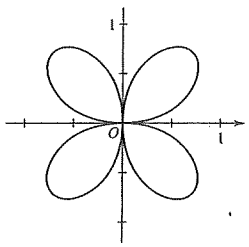
46. $0 \le \theta \le 2\pi$



47. The graph of $r = 1 + \sin n\theta$ has n loops.

48. As c increases, the "dimple" of the graph becomes an inner loop. **49.** IV **50.** I **51.** III **52.** II

53.



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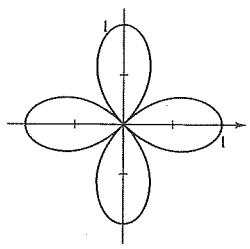

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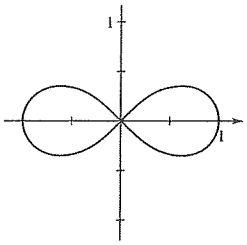
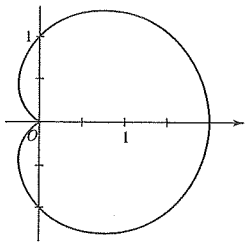
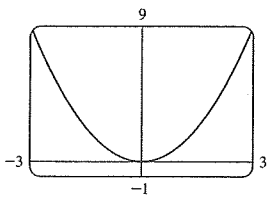


56.



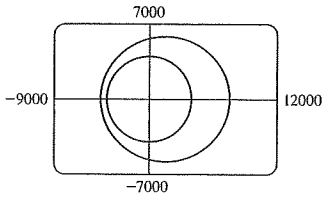
57. $\left(\frac{a}{2}, \frac{b}{2}\right), \frac{\sqrt{a^2 + b^2}}{2}$

58. (a)



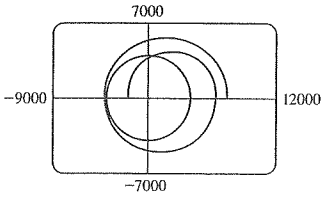
(b) $y = x^2$

59. (a) Elliptical



(b) π; 540 mi

60. (a) Spiral



(b) 2.1 rad

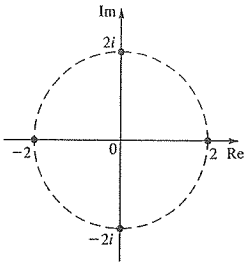
SECTION 8.3 ■ PAGE 562

1. real, imaginary, (a, b) **2. (a)** $\sqrt{a^2 + b^2}$, b/a **(b)** $r(\cos\theta + i\sin\theta)$

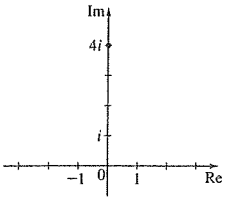
3. (a) $\sqrt{2}\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$; $\sqrt{3} + i$

(b) $1 + i$, $\sqrt{2}\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$

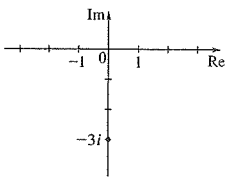
4. n; four; $2, 2i, -2, -2i$; 2



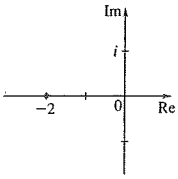
5. 4



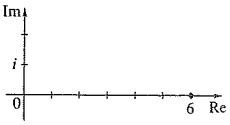
6. 3



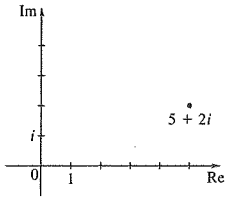
7. 2



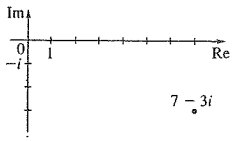
8. 6



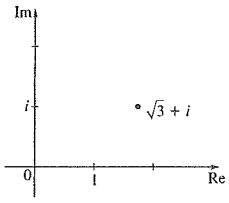
9. $\sqrt{29}$



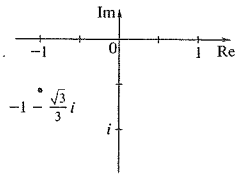
10. $\sqrt{58}$



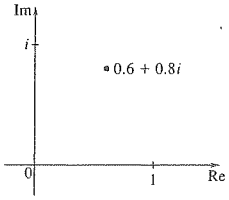
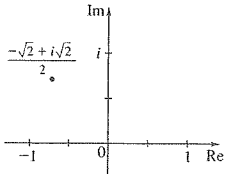
11. 2



12. $2\sqrt{3}/3$



13. 1



14. 1