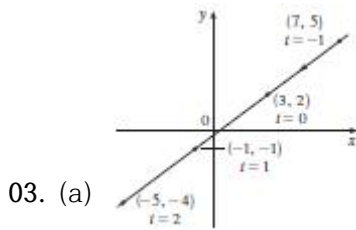
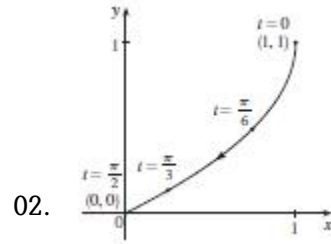
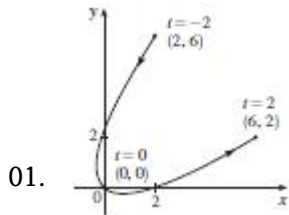


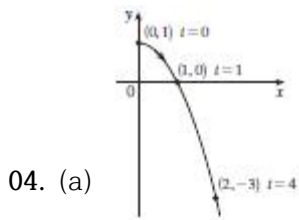
부록 E 해답

9장

연습문제 9.1

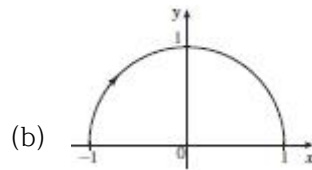


(b) $y = \frac{3}{4}x - \frac{1}{4}$

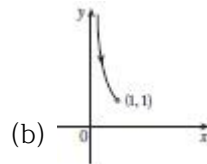


(b) $y = 1 - x^2, x \geq 0$

05. (a) $x^2 + y^2 = 1, y \geq 0$

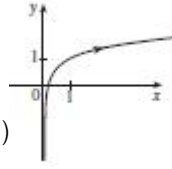


06. (a) $y = 1/x, y > 1$



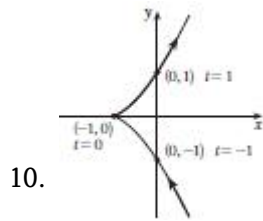
07. (a) $y = \frac{1}{2} \ln x + 1$

(b)

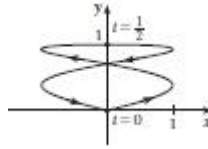


08. $(3, 3)$ 에서 $(3, -1)$ 까지 원 $(x-3)^2 + (y-1)^2 = 4$ 를 따라 시계 반대 방향으로 움직인다.

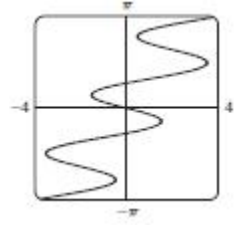
09. $(0, -2)$ 에서 시작하여 이 점에서 끝날 때까지 타원 $(x^2/25) + (y^2/4) = 1$ 를 따라 시계방향으로 세 번 움직인다.



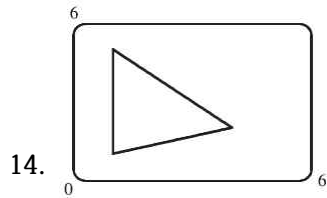
11.



12.



13. (a) 생략 (b) $x = -2 + 5t, y = 7 - 8t, 0 \leq t \leq 1$



15. (a) $x = 2 \cos t, y = 1 - 2 \sin t, 0 \leq t \leq 2\pi$

(b) $x = 2 \cos t, y = 1 + 2 \sin t, 0 \leq t \leq 6\pi$

(c) $x = 2 \cos t, y = 1 + 2 \sin t, \pi/2 \leq t \leq 3\pi/2$

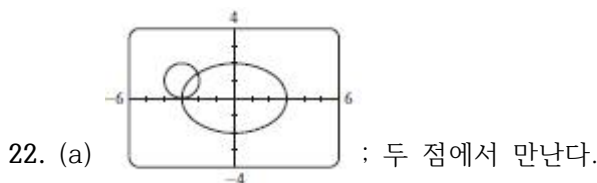
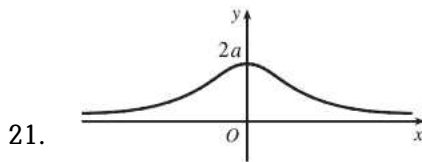
16. 생략

17. (a)는 곡선 $y = x^{2/3}$ 이다. (b)는 $x \geq 0$ 에서 곡선 $y = x^{2/3}$ 이다. (c)는 $x > 0$ 에서 곡선 $y = x^{2/3}$ 이다.

18. 생략

19. 생략

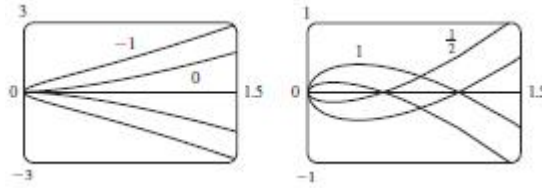
20. $x = a \cos \theta, y = b \sin \theta; (x^2/a^2) + (y^2/b^2) = 1$, 타원



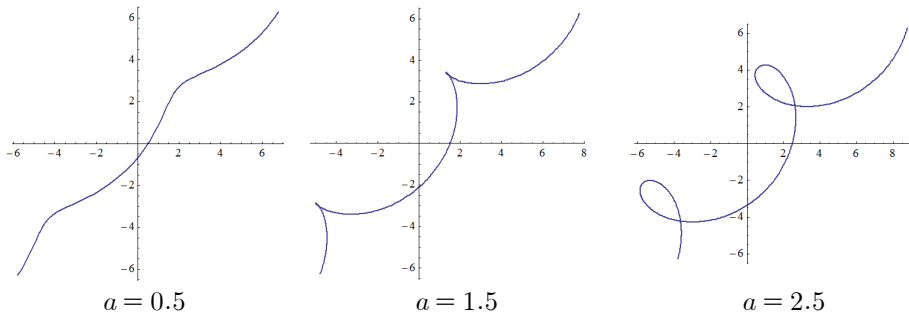
(b) $t = \frac{3\pi}{2}$ 일 때 $(-3, 0)$ 에서 진동한다.

(c) 두 개의 교점이 있으나 충돌하지 않는다.

23. $c = 0$ 이면 뾰족한 점이 존재한다. $c > 0$ 이면 c 가 커질수록 커지는 고리를 갖는다.



24. 곡선들은 대략적으로 직선 $y = x$ 에 따라간다. a 가 1.4와 1.6 사이(좀 더 정확하게 $a > \sqrt{2}$)일 때 고리를 가지고 시작한다. a 가 커질수록 고리가 증가한다.



25. n 이 증가할수록 진동횟수가 증가한다.; a 와 b 는 너비와 높이를 결정한다.

연습문제 9.2

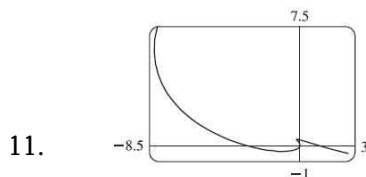
01. $\frac{2t+1}{t \cos t + \sin t}$ 02. $y = -\frac{3}{2}x + 7$ 03. $y = \pi x + \pi^2$ 04. $y = 2x + 1$

05. $\frac{2t+1}{2t}, -\frac{1}{4t^3}, t < 0$ 06. $e^{-2t}(1-t), e^{-3t}(2t-3), t > \frac{3}{2}$

07. $(0, -3)$ 에서 수평, $(\pm 2, -2)$ 에서 수직

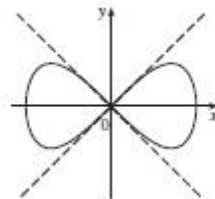
08. $(\pm \sqrt{2}, \pm 1)$ 에서 수평(4개의 점), $(\pm 2, 0)$ 에서 수직

09. $(0.6, 2); (5 \cdot 6^{-6/5}, e^{6^{-1/5}})$ 10. 생략



11.

12. $y = x, y = -x$;



13. (a) $d \sin \theta / (r - d \cos \theta)$ (b) 생략

14. $\left(\frac{16}{27}, \frac{29}{9}\right), (-2, -4)$

15. πab

16. $3 - e$

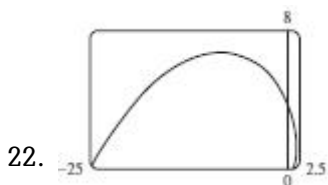
17. $2\pi r^2 + \pi d^2$

18. $\int_0^2 \sqrt{2 + 2e^{-2t}} dt \approx 3.1416$

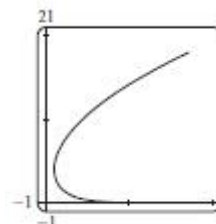
19. $\int_0^{4\pi} \sqrt{5 - 4 \cos t} dt \approx 26.7298$

20. $4\sqrt{2} - 2$

21. $\frac{1}{2}\sqrt{2} + \frac{1}{2}\ln(1 + \sqrt{2})$



; $\sqrt{2}(e^\pi - 1)$



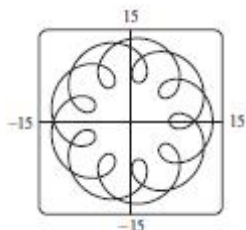
; $e^3 + 11 - e^{-8}$

24. 612.3053

25. 2.2605a

26. $6\sqrt{2}, \sqrt{2}$

27. 생략



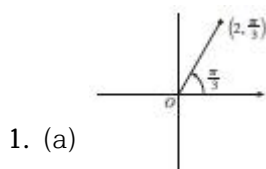
28. (a)

; $t \in [0, 4\pi]$

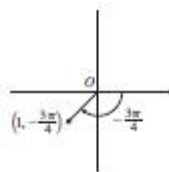
(b) 294

29. 생략

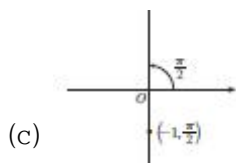
연습문제 9.3



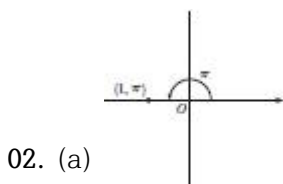
; $(2, \frac{7\pi}{3}), (-2, \frac{4\pi}{3})$



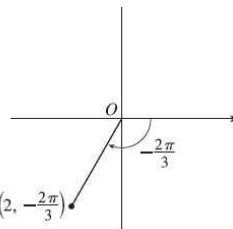
; $(1, \frac{5\pi}{4}), (-1, \frac{\pi}{4})$



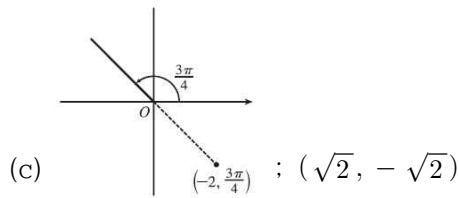
; $(1, \frac{3\pi}{2}), (-1, \frac{5\pi}{2})$



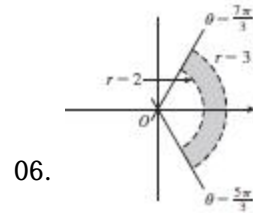
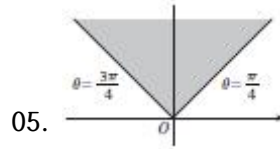
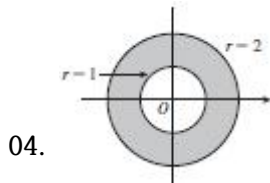
; $(-1, 0)$



; $(-1, -\sqrt{3})$



03. (a) (i) $(2\sqrt{2}, 7\pi/4)$ (ii) $(-2\sqrt{2}, 3\pi/4)$ (b) (i) $(2, 2\pi/3)$ (ii) $(-2, 5\pi/3)$



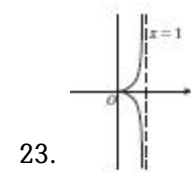
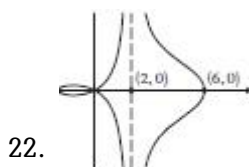
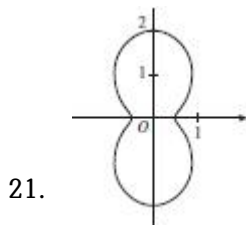
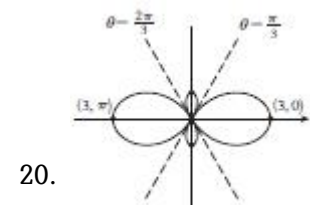
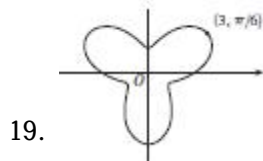
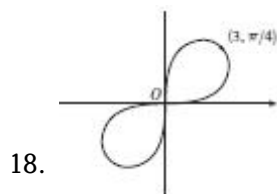
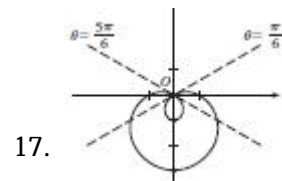
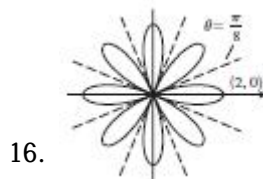
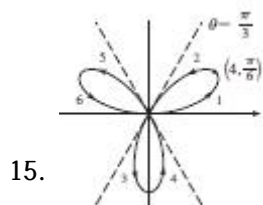
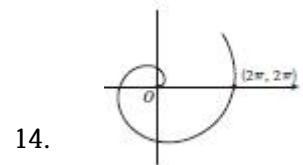
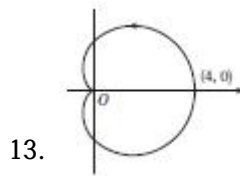
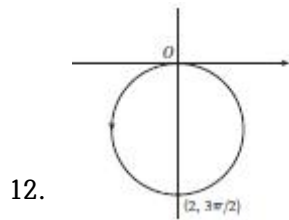
07. 원, 중심 $(1, 0)$, 반지름 1

08. 쌍곡선, 중심 O , x 축 위에 초점

09. $r = 1/(\sin \theta - 3 \cos \theta)$

10. $r = 2c \cos \theta$

11. (a) $\theta = \pi/6$ (b) $x = 3$

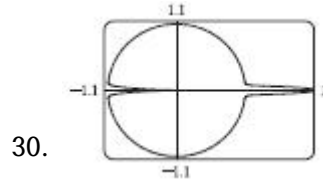
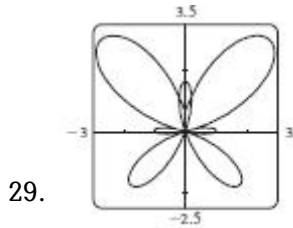


24. $\sqrt{3}$ 25. $-\pi$

26. $(3/\sqrt{2}, \pi/4), (-3/\sqrt{2}, 3\pi/4)$ 에서 수평, $(3, 0), (0, \pi/2)$ 에서 수직

27. $(\frac{3}{2}, \pi/3), (0, \pi)[\infty), (\frac{3}{2}, 5\pi/3)$ 에서 수평, $(2, 0), (\frac{1}{2}, 2\pi/3), (\frac{1}{2}, 4\pi/3)$ 에서 수직

28. 중심 $(b/2, a/2)$, 반지름 $\sqrt{a^2 + b^2}/2$



31. 원점에 관해 각 $\pi/6, \pi/3$ 또는 α 를 시계 반대 방향으로 회전시킨다.

32. n 이 홀수이면 n 개 고리를 가지고 n 이 짝수이면 $2n$ 개 고리를 가지는 장미

33. $0 < a < 1$ 에 대해 곡선은 계란형으로 $a \rightarrow 1^-$ 일수록 움푹 들어간다.

$a > 1$ 이면 곡선은 두 부분으로 나누어지며 그중 하나는 고리를 갖는다.

34. 생략

35. 생략

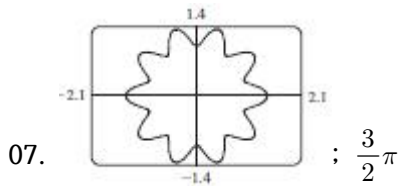
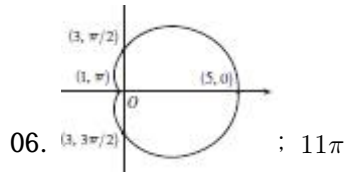
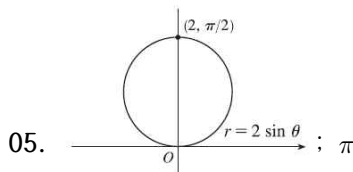
연습문제 9.4

01. $e^{-\pi/4} - e^{-\pi/2}$

02. $\frac{9}{2}$

03. π^2

04. $\frac{41}{4}\pi$



08. $\frac{4}{3}\pi$

09. $\pi - \frac{3}{2}\sqrt{3}$

10. $\frac{1}{3}\pi + \frac{1}{2}\sqrt{3}$

11. π

12. $\frac{5}{24}\pi - \frac{1}{4}\sqrt{3}$

13. $\frac{1}{2}\pi - 1$

14. $\frac{1}{4}(\pi + 3\sqrt{3})$

15. $(\frac{3}{2}, \pi/6), (\frac{3}{2}, 5\pi/6), \infty$

16. $(\frac{1}{2}\sqrt{3}, \pi/3), (\frac{1}{2}\sqrt{3}, 2\pi/3), \infty$

17. π

18. $\frac{8}{3}[(\pi^2 + 1)^{3/2} - 1]$

19. 8.0091

연습문제 9.5

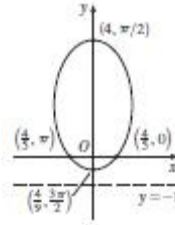
01. $r = \frac{4}{2 + \cos \theta}$

02. $r = \frac{6}{2 + 3 \sin \theta}$

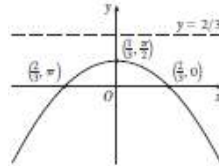
03. $r = \frac{8}{1 - \sin \theta}$

04. $r = \frac{4}{2 + \cos \theta}$

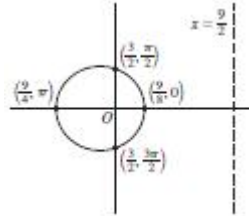
05. (a) $\frac{4}{5}$ (b) 타원 (c) $y = -1$ (d)



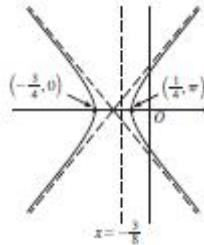
06. (a) 1 (b) 포물선 (c) $y = \frac{2}{3}$ (d)



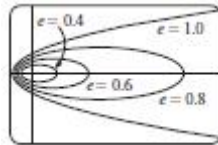
07. (a) $\frac{1}{3}$ (b) 타원 (c) $x = \frac{9}{2}$ (d)



08. (a) 2 (b) 쌍곡선 (c) $x = -\frac{3}{8}$ (d)



09. e 가 0에 가까워질수록 타원은 거의 원에 가깝고, $e \rightarrow 1^-$ 일수록 길게 늘어진다.
 $e = 1$ 에서 곡선은 포물선이 된다.



10. 생략

11. 생략

12. 생략

13. (a) 2 (b) $r = \frac{1.49 \times 10^8}{1 - 0.017 \cos \theta}$

14. 생략

15. 35.64 AU

16. 7.0×10^7 km

17. 0.249

18. 3.6×10^8 km

9장 복습문제

참-거짓 질문

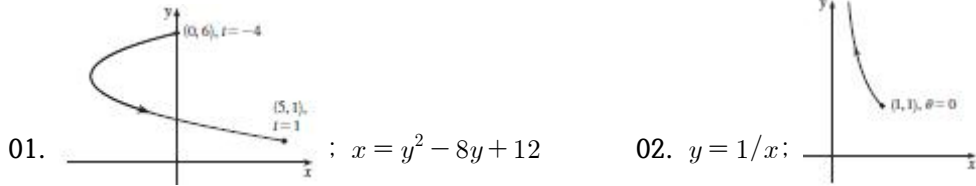
01. 거짓

02. 거짓

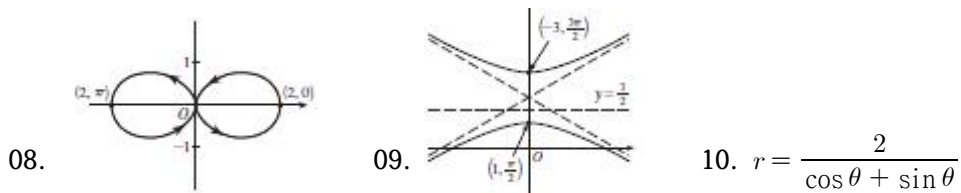
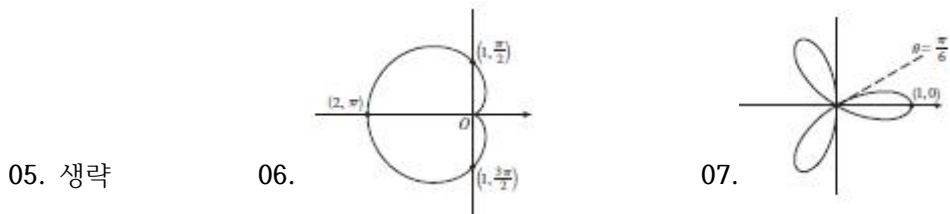
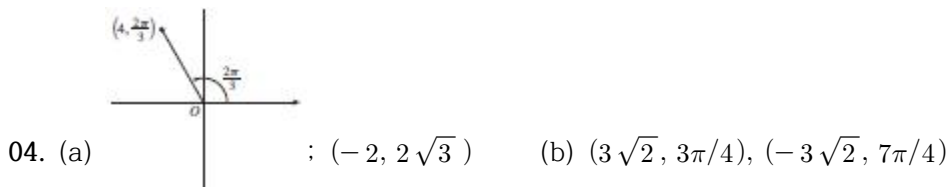
03. 참

04. 거짓

연습문제



03. $x = t, y = \sqrt{t}; x = t^4, y = t^2; x = \tan^2 t, y = \tan t, 0 \leq t < \pi/2$

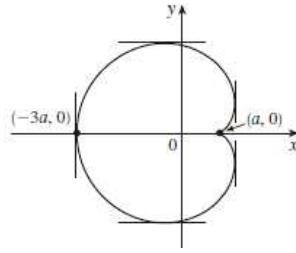


14. $\frac{1 + \sin t}{1 + \cos t}, \frac{1 + \cos t + \sin t}{(1 + \cos t)^3}$

15. $\left(\frac{11}{8}, \frac{3}{4}\right)$

16. $\frac{81}{20}$

17. $\left(\frac{3}{2}a, \pm \frac{1}{2}\sqrt{3}a\right), (-3a, 0)$ 에서 수직접선, $(a, 0), \left(-\frac{1}{2}a, \pm \frac{3}{2}\sqrt{3}a\right)$ 에서 수평접선

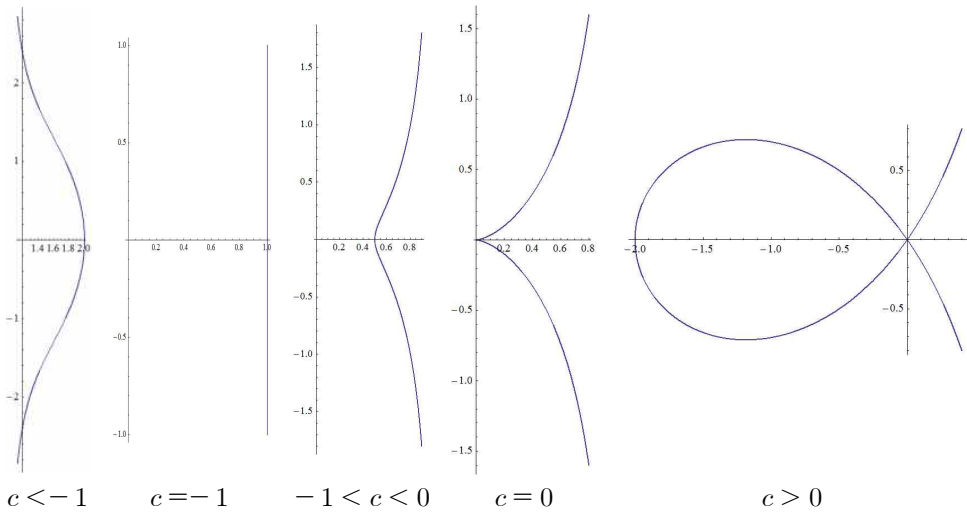


18. $6\pi a^2$ 19. 18 20. $(2, \pm \pi/3)$ 21. $\frac{1}{2}(\pi - 1)$

22. $2(5\sqrt{5} - 1)$

23. $\frac{2\sqrt{\pi^2+1} - \sqrt{4\pi^2+1}}{2\pi} + \ln\left(\frac{2\pi + \sqrt{4\pi^2+1}}{\pi + \sqrt{\pi^2+1}}\right)$

24. 모든 곡선은 수직점근선 $x = 1$ 을 갖는다. $c < -1$ 에 대해 배가 불룩하게 나온 모양이다. $c = -1$ 이면 곡선은 직선 $x = 1$ 이다. $-1 < c < 0$ 에 대해 왼쪽이 불룩하고 $c = 0$ 이면 $(0, 0)$ 에서 뾰족한 모양이다. $c > 0$ 일 때, 고리가 존재한다. 각 경우의 그림은 다음과 같다.



25. $r = 4/(3 + \cos\theta)$ 26. $x = a(\cot\theta + \sin\theta \cos\theta), y = a(1 + \sin^2\theta)$