

연습문제 해답

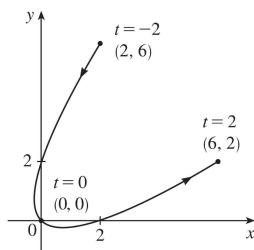
게시 일자 : 2018-05-14

9장

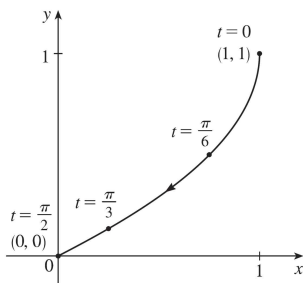
매개변수 방정식과 벡터

9.1 매개변수 곡선

01.



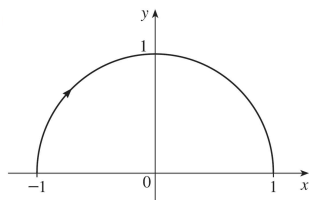
02.



03.

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

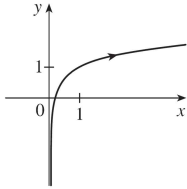
(b)



04.

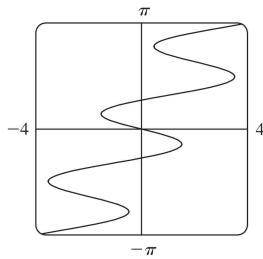
(a) $y = \frac{1}{2} \ln x + 1$

(b)



05. (3,3)에서 (3, -1)까지 원 $(x-3)^2 + (y-1)^2 = 4$ 를 따라 시계반대 방향으로 움직인다.

06.



07.

(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) $x = 2\cos t, y = 1 + 2\sin t, \frac{\pi}{2} \leq t \leq \frac{3\pi}{2}$

08. 생략

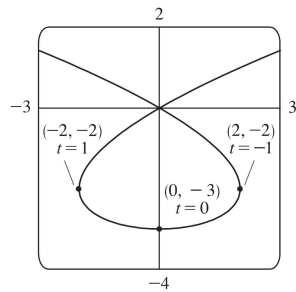
09. $\frac{2t+1}{t\cos t + \sin t}$

10. $y = -\frac{3}{2}x + 7$

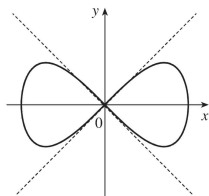
11. $y = 2x + 1$

12. $e^{-2t}(1-t), e^{-3t}(2t-3), t > \frac{3}{2}$

13. $(0, -3)$ 에서 수평, $(2, -2)$, $(-2, -2)$ 에서 수직



14. $y = x$, $y = -x$



15. πab

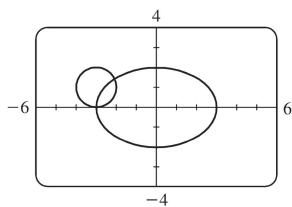
16. $\int_0^{4\pi} \sqrt{5 - 4\cos t} \, dt \approx 26.7298$

17. $2(2\sqrt{2} - 1)$

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

- 19.

(a)



; 두 점에서 만난다.

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

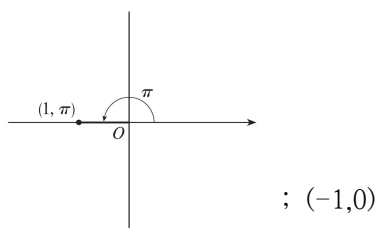
(c) 두 개의 교점이 있으나 충돌하지 않는다.

20. 생략

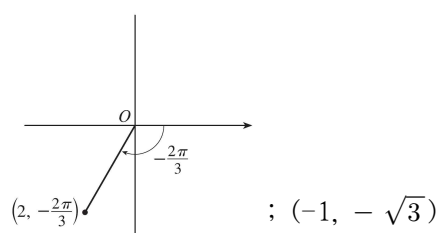
9.2 극좌표

01.

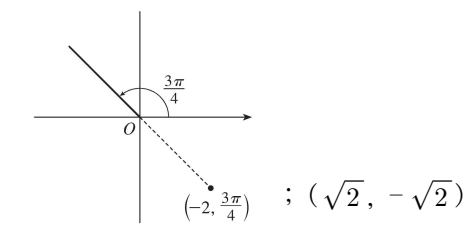
(a)



(b)



(c)

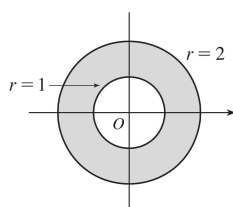


02.

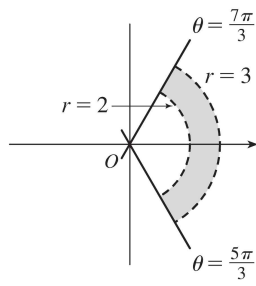
(a) (i) $(2\sqrt{2}, \frac{7\pi}{4})$ (ii) $(-2\sqrt{2}, \frac{3\pi}{4})$

(b) (i) $(2, \frac{2\pi}{3})$ (ii) $(-2, \frac{5\pi}{3})$

03.



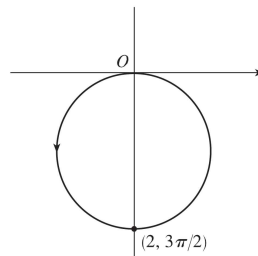
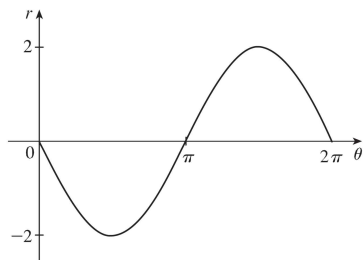
04.



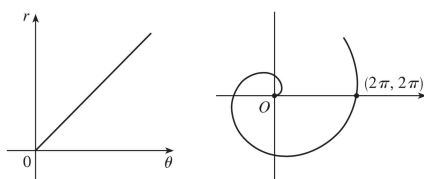
05. 쌍곡선, 중심 O , x 축 위에 초점

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

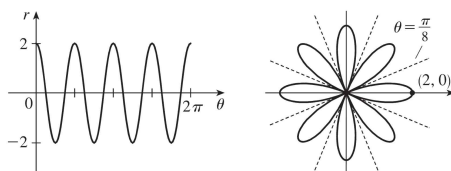
07.



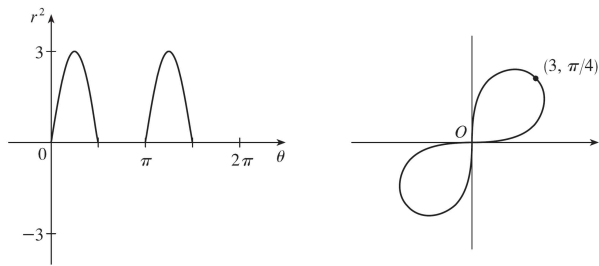
08.



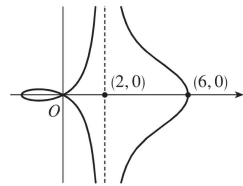
09.



10.



11.



12. $\sqrt{3}$

13. $-\pi$

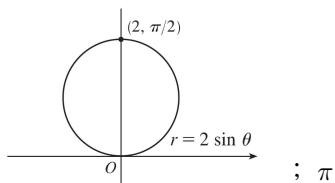
14. $\left(\frac{3}{\sqrt{2}}, \frac{\pi}{4}\right), \left(-\frac{3}{\sqrt{2}}, \frac{3\pi}{4}\right)$ 에서 수평, $(3, 0), (0, \pi/2)$ 에서 수직

15. $\left(\frac{3}{2}, \frac{\pi}{3}\right), (0, \pi), \left(\frac{3}{2}, \frac{5\pi}{3}\right)$ 에서 수평, $(2, 0), \left(\frac{1}{2}, \frac{2\pi}{3}\right), \left(\frac{1}{2}, \frac{4\pi}{3}\right)$ 에서 수직

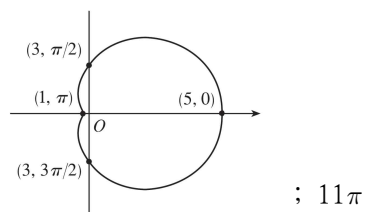
16. $e^{-\pi/4} - e^{-\pi/2}$

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

18.



19.



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

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

22. $\frac{\pi}{3} + \frac{\sqrt{3}}{2}$

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

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

25. $\left(\frac{3}{2}, \frac{\pi}{6}\right), \left(\frac{3}{2}, \frac{5\pi}{6}\right), \nexists$

26. $\left(\frac{\sqrt{3}}{2}, \frac{\pi}{3}\right), \left(\frac{\sqrt{3}}{2}, \frac{2\pi}{3}\right), \nexists$

27. π

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

29. 생략

9.3 행렬과 행렬식

1. $a = 3, b = 2, c = d = 1$

2. $a = \frac{3}{2}, b = -\frac{1}{2}, c = 7, d = 3$

3. (a) $\begin{pmatrix} 3 & 6 & -8 \\ 3 & 3 & 3 \\ -6 & 9 & -3 \end{pmatrix}$ (b) $\begin{pmatrix} 5 & 4 & -2 \\ -1 & 3 & 3 \\ 6 & 7 & 5 \end{pmatrix}$ (c) $\begin{pmatrix} -1 & 1 & -5 \\ 2 & 0 & 0 \\ -6 & 1 & -4 \end{pmatrix}$ (d) $\begin{pmatrix} -16 & -5 & -9 \\ 5 & 4 & 5 \\ -11 & -1 & -2 \end{pmatrix}$

4. $k = -\frac{2}{7}$

5. $k = \frac{-2 \pm \sqrt{6}}{2}$

6. $\begin{pmatrix} 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \\ 5 & 6 & 7 & 8 \end{pmatrix}$

7. $\begin{pmatrix} -1 & -1 & 1 & 1 \\ -1 & -1 & -1 & 1 \\ 1 & -1 & -1 & -1 \\ 1 & 1 & -1 & -1 \end{pmatrix}$

8. $A = \begin{pmatrix} 1 & 1 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

9. 생략

10. -11

11. 6

12. 0

13. -7

14. $4ab$

15. $-a^3 - b^3 - c^3 + 3abc$

16. $a^2 + b^2 + c^2 - ab - bc - ca$

17. $(a-b)(b-c)(c-a)$

18. $(bc-ad)^2$

19. $\lambda = -1 \pm \sqrt{13}$

20. $\lambda = 1$

21. 직선 $y = \frac{b_2 - b_1}{a_2 - a_1}x + \frac{a_2b_1 - a_1b_2}{a_2 - a_1}$

22. 생략

23. $x = 6, y = 5, z = 0$

24. $x = 12, y = 2, z = -3$

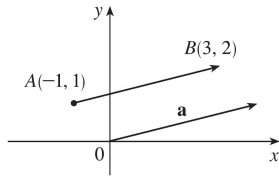
25. $x = \frac{7}{4} + \frac{9}{8}t, y = -\frac{11}{2} - \frac{15}{4}t, z = -\frac{11}{2} - \frac{25}{8}t, w = t$

26. $i_1 = \frac{13}{5}, i_2 = -\frac{2}{5}, i_3 = \frac{11}{5}$ 27. $i_1 = -\frac{5}{22}, i_2 = \frac{7}{22}, i_3 = \frac{6}{11}$

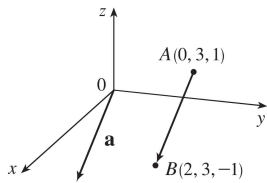
9.4 벡터

01. $\overrightarrow{AB} = \overrightarrow{DC}$, $\overrightarrow{DA} = \overrightarrow{CB}$, $\overrightarrow{DE} = \overrightarrow{EB}$, $\overrightarrow{EA} = \overrightarrow{CE}$

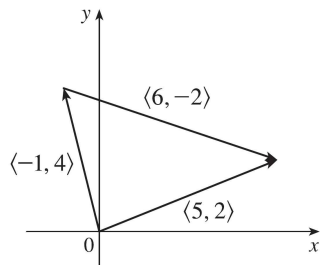
02. $\mathbf{a} = \langle 4, 1 \rangle$



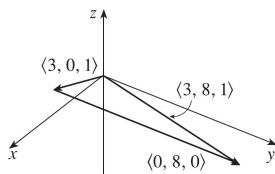
03. $\mathbf{a} = \langle 2, 0, -2 \rangle$



04. $\langle 5, 2 \rangle$



05. $\langle 3, 8, 1 \rangle$



06. $\langle 2, -18 \rangle$, $\langle 1, -42 \rangle$, 13, 10

07. $-i + j + 2k$, $-4i + j + 9k$, $\sqrt{14}$, $\sqrt{82}$

08. $\frac{9}{8}i - \frac{1}{9}j + \frac{4}{9}k$

09. 60°

10. $\approx 45.96\text{ft}$, $\approx 38.57\text{ft/s}$

11. 139.1°

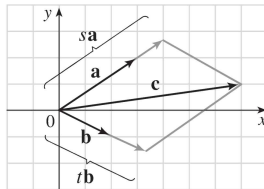
12. $T_1 = -196\mathbf{i} + 3.92\mathbf{j}$, $T_2 = 196\mathbf{i} + 3.92\mathbf{j}$

13.

- (a) 제방에서 43.4° 의 각으로 상류를 향하여
- (b) 20.2분

14.

(a), (b)



(c) $s \approx 1.3$. $t \approx 1.6$

(d) $s=9/7$, $t=11/7$

15. 중심이 (x_0, y_0, z_0) 이고 반지름이 1인 구

9.5 내적과 외적

01.

(a), (e), (f)는 의미가 없다. (b), (c), (d)는 의미가 있다.

02.

(a) 스칼라

(b) 의미가 없다.

(c) 벡터

(d) 의미가 없다.

(e) 의미가 없다.

(f) 스칼라

03. 1

04. -15

05.

(a) $16i+48k$

(b) $15i-3j+3k$

06. 생략

07. 0

08. $i+j+k$

09. $\cos^{-1}\left(\frac{1}{\sqrt{5}}\right) \approx 63^\circ$

10. $\cos^{-1}\left(\frac{7}{\sqrt{130}}\right) \approx 52^\circ$

11.

(a) 수직

(b) 평행

12. 그렇다.

13. 45°

14.

(a) $\langle 0, 18, -9 \rangle$

(b) $\frac{9}{2} \sqrt{5}$

15. $4, \left\langle -\frac{20}{13}, -\frac{48}{13} \right\rangle$

16. $\frac{9}{7}, \left\langle \frac{27}{49}, \frac{54}{49}, -\frac{18}{49} \right\rangle$

17. $-7\mathbf{i}+10\mathbf{j}+8\mathbf{k}, 7\mathbf{i}-10\mathbf{j}-8\mathbf{k}$

18. $\left\langle -\frac{1}{3\sqrt{3}}, -\frac{1}{3\sqrt{3}}, \frac{5}{3\sqrt{3}} \right\rangle, \left\langle \frac{1}{3\sqrt{3}}, \frac{1}{3\sqrt{3}}, -\frac{5}{3\sqrt{3}} \right\rangle$

19. 16

20. 생략

21. $\langle 0, 0, -2\sqrt{10} \rangle$ 또는 $\langle s, t, 3s - 2\sqrt{10} \rangle, s, t \in R$

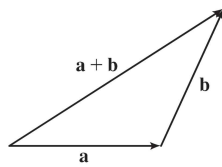
22. $560 \cos 20^\circ \approx 526\text{J}$

23. 생략

24. 생략

25.

(a)



(b) 생략

26. 9

27. $10.8 \sin 80^\circ \approx 10.6 \text{N}\cdot\text{m}$

28. $\approx 417\text{N}$

29. 60°

30.

(a) 생략

(b) $\sqrt{\frac{97}{3}}$

9.6 직선과 평면의 방정식

01.

- (a) 참
- (b) 거짓
- (c) 참
- (d) 거짓
- (e) 거짓
- (f) 참
- (g) 거짓
- (h) 참
- (i) 참
- (j) 거짓
- (k) 참

02. $r=(2i+2.4j+3.5k)+t(3i+2j-k); x=2+3t, y=2.4+2t, z=3.5-t$

03. $r=(i+6k)+t(i+3j+k); x=1+t, y=3t, z=6+t$

04. $x=2+2t, y=1+\frac{1}{2}t, z=-3-4t; \frac{x-2}{2}=2y-2=\frac{z+3}{-4}$

05. $x=1+t, y=-1+2t, z=1+t; x-1=\frac{y+1}{2}=z-1$

06. 평행하다.

07. $r(t)=(2i-j+4k)+t(2i+7j-3k), 0 \leq t \leq 1$

08. 교차한다. (4, -1, -5)

09. $x+4y+z=4$

10. $5x-y-z=7$

11. $x+y+z=2$

12. $x-2y+4z=-1$

13. (2,3,5)

14. 아무것도 아니다. $\cos^{-1}\left(\frac{1}{3}\right) \approx 70.5^\circ$

15.

(a) $x = 1, y = -t, z = t$

(b) $\cos^{-1}\left(\frac{5}{3\sqrt{3}}\right) \approx 15.8^\circ$

16. $x = 3t, y = 1 - t, z = 2 - 2t$

17. $\frac{5}{2\sqrt{14}}$

18. 생략

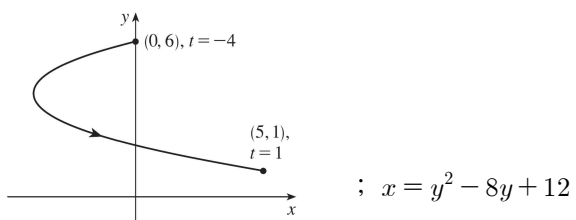
19. $\frac{1}{\sqrt{6}}$

20. 생략

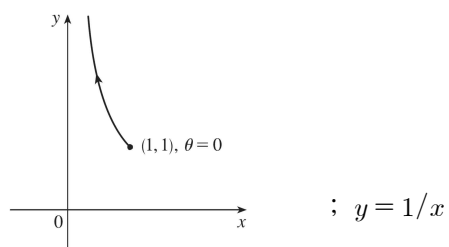
8장 복습문제

연습문제

01.

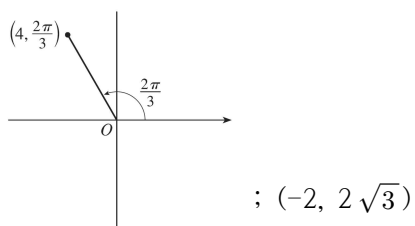


02.



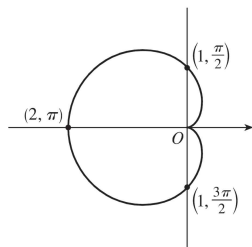
03.

(a)

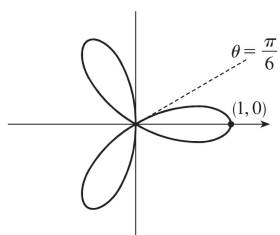


(b) $(3\sqrt{2}, 3\pi/4)$, $(3\sqrt{2}, 11\pi/4)$, $(-3\sqrt{2}, 7\pi/4)$

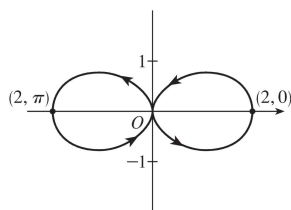
04.



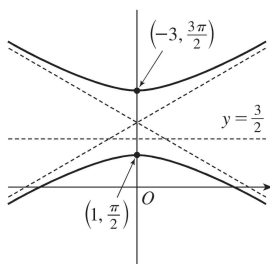
05.



06.



07.



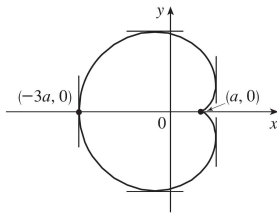
08. $r = \frac{2}{\cos \theta + \sin \theta}$

09. 2

10. -1

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

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



13. $6\pi a^2$

14. $\frac{1}{2}(\pi-1)$

15. $2(5\sqrt{5}-1)$

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

17. $\begin{pmatrix} 1 & -1 & 1 & -1 \\ -1 & 1 & -1 & 1 \\ 1 & -1 & 1 & -1 \\ -1 & 1 & -1 & 1 \end{pmatrix}$

18. $\begin{pmatrix} 0 & -1 & -2 & -1 \\ 1 & 0 & -1 & 1 \\ 1 & 1 & 0 & -1 \\ -1 & 1 & 1 & 0 \end{pmatrix}$

19. 0

20. $(a+3)(a-1)^3$

21. $bc^2(a^3+3a^2b-ab^2+b^3-ac^2+bc^2)$

22. 1

23. $x=-1$

24. $x = 3$

25. $x = 3, y = -4, z = -\frac{8}{3}, w = \frac{2}{3}$

26. $x = \pm 1, y = \pm \sqrt{3}, z = \pm \sqrt{2}$

27. $i_1 = 6, i_2 = -5, i_3 = 1$

28. $i_1 = i_2 = i_3 = 1, i_4 = i_6 = 0, i_5 = -1$

29.

(a) $(x+1)^2 + (y-2)^2 + (z-1)^2 = 69$

(b) $(y-2)^2 + (z-1)^2 = 68, x = 0$

(c) 중심 $(4, -1, -3)$, 반지름 5

30. $-2, -4$

31.

(a) $\langle 4, -3, 4 \rangle$

(b) $\frac{\sqrt{41}}{2}$

32. $x = 4 - 3t, y = -1 + 2t, z = 2 + 3t$

33. $(1, 4, 4)$

34. 꼬임

35. $x + y + z = 4$

36. $\frac{22}{\sqrt{26}}$