

MSE, 미적분학

[연습문제 답안 이용 안내]

- 본 연습문제 답안의 저작권은 한빛아카데미(주)에 있습니다.
- 이 자료를 무단으로 전제하거나 배포할 경우 저작권법 136조에 의거하여 최고 5년 이하의 징역 또는 5천만원 이하의 벌금에 처할 수 있고 이를 병과(併科)할 수도 있습니다.

Chapter 09 연습문제 답안

《Section 9.1》

1.
 - (a) $\sqrt{86}$
 - (b) $\sqrt{62}$
 - (c) 7
 - (d) 2
 - (e) $\sqrt{13}$
 - (f) $\sqrt{53}$
 - (g) $\sqrt{y^2 + x^2}$
 - (h) $\sqrt{y^2 + x^2}$
2. $\overrightarrow{AF} = (-4, 0, 3), \overrightarrow{HB} = (4, 5, 0), \overrightarrow{HE} = (4, 5, 3)$
3. $(0, 2)$
4. $(-3, 2), (3, -2), (6, -4), (-6, 4)$
5. $(-3, -3)$
6. $(4, 1, 10)$
7. $(-\frac{3}{2}, \frac{3}{2}\sqrt{3})$

《Section 9.2》

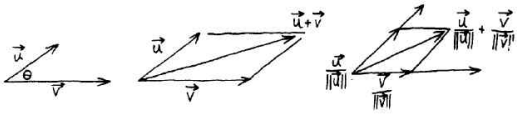
1. (a) \overrightarrow{DB}
 (b) \overrightarrow{DB}
 (c) \overrightarrow{DB}
 (d) \overrightarrow{AC}
 (e) $\vec{0}$
2. $(6, 7, 8)$
3. $\overrightarrow{CD} = -2\overrightarrow{AB}$
4. $z = -34/3$
5. 아니오
6. $\frac{1}{10}(Q+9P), \frac{1}{10}(2Q+8P), \frac{1}{10}(3Q+7P)$
7. $a = -1, b = 2$
8. $\vec{0}$
9. (a) $\vec{0}$
 (b) $\vec{0}$
10. $(2/\sqrt{104}, -6/\sqrt{104}, 8/\sqrt{104})$
11. $-5\vec{u}/|\vec{u}|$
12. $(1, 2 - \frac{12}{\sqrt{17}}, 6 - \frac{48}{\sqrt{17}})$
13. $217\sqrt{38}$
14. $(\cos\theta, \sin\theta)$

15. $(-12/\sqrt{52}, 0, -18/\sqrt{52})$

16. $(\frac{-5}{110\sqrt{110}}, \frac{-6}{110\sqrt{110}}, \frac{-7}{110\sqrt{110}})$

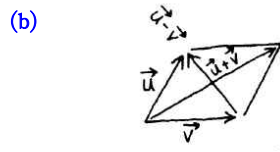
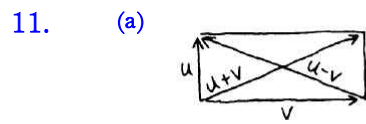
17. $(2/\sqrt{14})\vec{i} + (3/\sqrt{14})\vec{j} - (1/\sqrt{14})\vec{k}$

18. r^4

19. 

《Section 9.3》

1. 예 각
2. -30
3. 25°
4. (a) $\cos\theta_1 = \frac{u_1}{|u|}, \cos\theta_2 = \frac{u_2}{|u|}, \cos\theta_3 = \frac{u_3}{|u|}$
 (b) $(\cos\theta_1, \cos\theta_2, \cos\theta_3) = \left(\frac{u_1}{|u|}, \frac{u_2}{|u|}, \frac{u_3}{|u|}\right) = \frac{\vec{u}}{|u|}$
5. (a) AB 의 기울기 $= \frac{5}{3}, CD$ 의 기울기 $= -\frac{3}{5}$
 (b) $\overrightarrow{AB} \cdot \overrightarrow{CD} = 0$
6. $(8 - \frac{35}{\sqrt{61}}, 9 + \frac{42}{\sqrt{61}})$
7. $\cos\theta = \frac{26}{\sqrt{53}\sqrt{17}}$
8. $\vec{u} \cdot (a\vec{v} - b\vec{u}) = 0$
9. $\sqrt{3}$
10. (a) 33
 (b) 의미 없음.
 (c) $(5\sqrt{42}, 2\sqrt{42}, 3\sqrt{42} - 4\sqrt{42})$
 (d) 의미 없음.
 (e) $2/\sqrt{54}$
 (f) $(132, -99, 33, -132)$
 (g) 의미 없음.



12. (a) $-7/\sqrt{11}$

(b) $-7/\sqrt{29}$

13. $96/\sqrt{153}$

14. (a) 6

(b) -6

(c) 24

15. -3

16. 인정될 수 없다.

17. 아니오.

18. \vec{u}

19. $\frac{20}{29}\vec{i} - \frac{8}{29}\vec{j}$

20. \vec{p}

《Section 9.4》

1. $\vec{u} \times \vec{v}$: 이 페이지 위
 $\vec{p} \times \vec{q}$: 동쪽
 $\vec{s} \times \vec{t} = 0$

2. $\vec{u} = \vec{0}, \vec{v} = \vec{0}$

3. $\vec{0}$

4. $\vec{a} \times \vec{x} = \vec{b}$ 이면, $\vec{b} \perp \vec{a}$ 이고 $\vec{b} \perp \vec{x}$ 이다.
 이때 $\vec{a} \cdot \vec{b} \neq 0$ 이면 \vec{a} 와 \vec{b} 는 수직일 수 없다.
 따라서 이를 만족하는 \vec{x} 는 없다.

5. (a) 내적은 벡터끼리의 연산이므로.

(b) 0

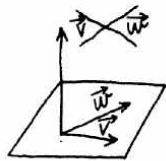
(c) 0

6. $\vec{0}$

7. $\vec{0}$

8. $15(\vec{u} \times \vec{v})$

9.



10. (a) $(-11, -12, 27)$

(b) $-17\vec{i} + 13\vec{j} + \vec{k}$

(c) $(0, 0, 21)$

(d) $(4, 2, 11)$

11. $(13, -11, 3)$

12. $\cos\theta = \frac{5}{\sqrt{14}\sqrt{30}}, \sin\theta = \frac{\sqrt{395}}{\sqrt{14}\sqrt{30}}$

13. (a) $\vec{i} + 2\vec{j}, 6\vec{i} + 3\vec{j} - 3\vec{k}$
(b) $(-3, 27, 11)$

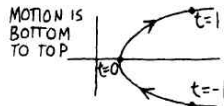
14. $\frac{1}{2} \sqrt{(24)^2 + (31)^2 + (30)^2}$

《Section 9.5》

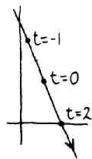
1. 0
2. 16
3. $\overrightarrow{AB} \cdot \overrightarrow{AC} \times \overrightarrow{AD} = 12 \neq 0$ (한 평면에 있지 않음)
4. 음수
5. 0
6.
 - (a) -5
 - (b) 5
 - (c) 5
 - (d) -300
 - (e) 0
 - (f) 0

《Section 9.6》

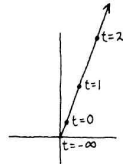
1. (a) $x = y^2 + 5$



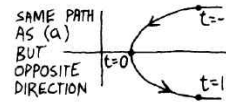
(c) $y = 8 - 2x$



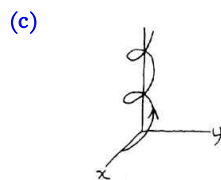
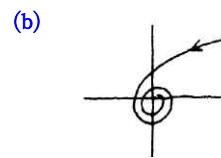
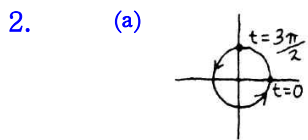
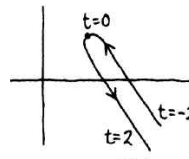
(e) $y = 2x$



(b) $x = y^2 + 5$



(d) $x = y^2 + 5$



3. (a) $y = -3\sin t$

(b) $y = 7 + 3\sin t$

(c) $y = 3\sin 2\pi t$

4. (a) 지나지 않음

(b) $t = -1$

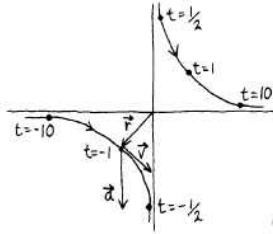
5. \vec{r}_1 의 자취를 5초 후에 \vec{r}_2 가 따라감

6. 7

7. $3t^2\vec{i} + 2\vec{j} - \sin t\vec{k}$
8. $\vec{v} = -i - \pi\vec{j}$
9. (a) 6
(b) $\vec{v} = -6\vec{i}$
10. $|\vec{v}| = \sqrt{1 + 4t^2}$
11. $|\vec{t}| = \sqrt{4t^2([\sin t^2]^2 + \cos t^2)^2} = 2|t|$
12. (a) \vec{v} 는 일정하므로 직선
(b) $|\vec{v}| = \sqrt{29}$
(c) $(-1 + \frac{6}{\sqrt{29}}t)\vec{i} + (1 - \frac{4}{\sqrt{29}}t)\vec{j} + \frac{8}{\sqrt{29}}t\vec{k}$
13. (a) 원점에서 움직이지 않음
(b) 움직이지 않음
14. (a) $(t^2 - 8)\vec{i} + (\frac{5}{3}t^3 - 41)\vec{j} + (6t - 12)\vec{k}$
(b) $(4/\sqrt{452})\vec{i} + (20/\sqrt{452})\vec{j} + (6/\sqrt{452})\vec{k}$
15. (a) $x^2/9 + y^2/4 = 1$
(b) 속력 = $\sqrt{5\sin^2 t + 4}$, 최대 속력 = 3

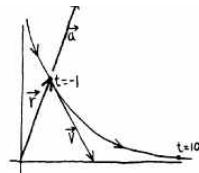
《Section 9.7》

1.



$t = -1$ 일 때, 가속한다.
 변화량 : $\sqrt{2}$
 힘 : $2m$ (질량이 m 일 때)

2.



속력은 줄어든다.

3.

$$\begin{aligned}\vec{r}'' &= \vec{a} = \vec{f}/m \\ \vec{r} \times \vec{r}'' &= \vec{r} \times (\vec{f}/m) = \left(\frac{1}{m}\right)(\vec{r} \times \vec{f}) \\ \vec{f} &\parallel \vec{r}\end{aligned}$$

4.

$$\vec{r} = (4t+1)\vec{i} + \left(-\frac{1}{2}gt^2 + 2t + 2\right)\vec{j}$$

5.

$$\begin{aligned}\text{(a)} \quad \frac{ds}{dt} &= \text{거리의 변화(속력)} = |\vec{v}| \\ \frac{d^2s}{dt^2} &= \text{속력의 변화(가속도)} = a_{\text{tan}} \\ \text{(b)} \quad \frac{d\vec{r}}{ds} &= \frac{d\vec{r}/dt}{ds/dt} = \frac{\vec{v}}{|\vec{v}|}\end{aligned}$$

6.

$$\begin{aligned}\text{(a)} \quad &5 \\ \text{(b)} \quad \vec{a} &= (-5\cos t, -5\sin t), a_{\text{tan}} = 0 \\ \text{(c)} \quad a_{\text{rad}} &= 5\end{aligned}$$

7.

$$\begin{aligned}\text{(a)} \quad &\vec{a} \parallel \vec{v} \\ \text{(b)} \quad &\vec{a} \perp \vec{v}\end{aligned}$$

8. $(3, 5/4)$
 $\vec{v} = -3\vec{i} + 2\vec{j}, |\vec{v}| = \sqrt{13}$
 $\vec{a} = -6\vec{i} + 3\vec{j}$
 $m|\vec{a}| = m\sqrt{45}$

《복습문제》

1. (a) 5
 (b) $\sqrt{14}$
 (c) $(-11, 0, 22)$
 (d) $\frac{5}{\sqrt{14}\sqrt{45}}$
 (e) $5/\sqrt{45}$
 (f) $(-4/9, 5/9, -2/9)$
 (g) $(-4/\sqrt{45})\vec{i} + (5/\sqrt{45})\vec{j} - (2/\sqrt{45})\vec{k}$
 (h) $(12/\sqrt{14})\vec{i} + (18/\sqrt{14})\vec{j} - (6/\sqrt{14})\vec{k}$

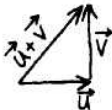
2. 아니오

3. (a) $\vec{j} - 5\vec{k}$ (b) 6

4. (a) 참 (b) 거짓

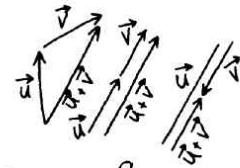
5. -2

$$6. \vec{u} \times \vec{v} = (0, 0, \begin{vmatrix} u_1 & u_2 \\ v_1 & v_2 \end{vmatrix})$$

7. (a) 

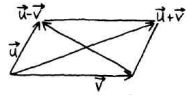
$$(b) (\vec{u} + \vec{v}) \cdot (\vec{u} + \vec{v}) = |\vec{u}|^2 + |\vec{v}|^2$$

$$8. |\vec{u} \times \vec{v}| = |\vec{u}| \times |\vec{v}|$$

9. 

10. (a) $|\vec{u} + \vec{v}|^2 + |\vec{u} - \vec{v}|^2 = 2\vec{u} \cdot \vec{u} + \vec{u} \cdot \vec{v} + \vec{v} \cdot \vec{u} + 2\vec{v} \cdot \vec{v} = 2|\vec{u}|^2 + 2|\vec{v}|^2$

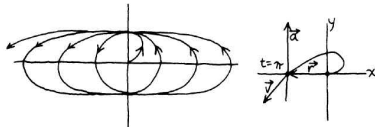
(b)



11. 역풍, $8/\sqrt{42} \text{ mph}$ 감소

12. $\vec{u} \perp \vec{v}$

13.



$$\vec{v} = (-t \sin t + \cos t) \vec{i} + \cos t \vec{j}$$

$$\vec{a} = (-t \cos t - 2 \sin t) \vec{i} - \sin t \vec{j}$$

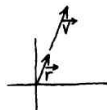
$$(t = \pi) \vec{r} = -\pi \vec{i}, \vec{v} = -\vec{i} - \vec{j}, \vec{a} = \pi \vec{i}$$

$\pi/\sqrt{2} [m/s]$ 감소

14. (a)



(b)



(c) 직선 운동

(d) 등속도 운동