

연습문제 해답

게시 일자 : 2018-05-14

11장

중적분

11.1 직사각형 영역에서 이중적분

01.

(a) 288

(b) 144

02.

(a) 0.990

(b) 1.151

03. 60

04. 3

05. 222

06. 18

07. $\frac{21}{2} \ln 2$

08. $\frac{31}{30}$

09. $\frac{1}{2}(\sqrt{3}-1) - \frac{1}{12}\pi$

10. $\frac{1}{2}e^{-6} + \frac{5}{2}$

11. 51

12. 2

13. $\frac{5}{6}$

14. 생략

15. 생략

16. 0

11.2 일반적인 영역에서 이중적분

01. 32

02. $\frac{3}{10}$

03. $\frac{4}{3}$

04. π

05. 유형 I: $D = \{(x, y) \mid 0 \leq x \leq 1, 0 \leq y \leq x\}$,

유형 II: $D = \{(x, y) \mid 0 \leq y \leq 1, y \leq x \leq 1\}$; $\frac{1}{3}$

06. $\frac{1}{2}(1 - \cos 1)$

07. $\frac{11}{3}$

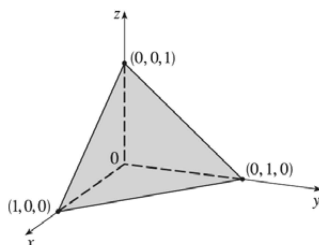
08. $\frac{17}{60}$

09. 6

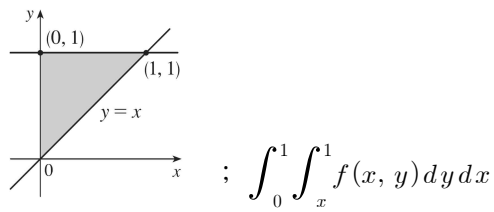
10. $\frac{1}{3}$

11. $\frac{64}{3}$

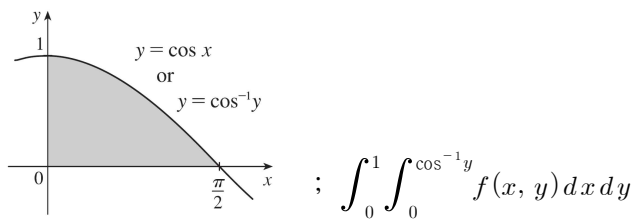
12.



13.



14.



15. $\frac{1}{6}(e^9 - 1)$

16. $\frac{1}{3} \ln 9$

17. 유형 I

$$D = \{(x, y) \mid 0 \leq x \leq 1, -x + 1 \leq y \leq 1\} \cup \{(x, y) \mid -1 \leq x \leq 0, x + 1 \leq y \leq 1\} \\ \cup \{(x, y) \mid 0 \leq x \leq 1, -1 \leq y \leq x - 1\} \cup \{(x, y) \mid -1 \leq x \leq 0, -1 \leq y \leq -x - 1\}; \quad 1$$

18. 유형 II

$$D = \{(x, y) \mid -1 \leq y \leq 0, -1 \leq x \leq y - y^3\} \cup \{(x, y) \mid 0 \leq y \leq 1, \sqrt{y} - 1 \leq x \leq y - y^3\}; \quad -\frac{2}{15}$$

19. $0 \leq \iint_D \sqrt{x^3 + y^3} dA \leq \sqrt{2}$

20. 9π

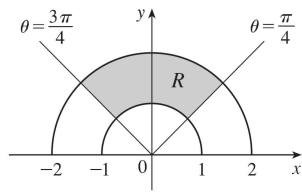
21. $\pi a^2 b$

11.3 극좌표에서 이중적분

01. 극좌표; $\int_0^{3\pi/2} \int_0^4 f(r \cos \theta, r \sin \theta) r dr d\theta$

02. 직교좌표; $\int_{-1}^1 \int_0^{(x+1)/2} f(x, y) dy dx$

03.



; $3\pi/4$

04. $\frac{1250}{3}$

05. $(\pi/4)(\cos 1 - \cos 9)$

06. $\frac{16}{3}\pi$

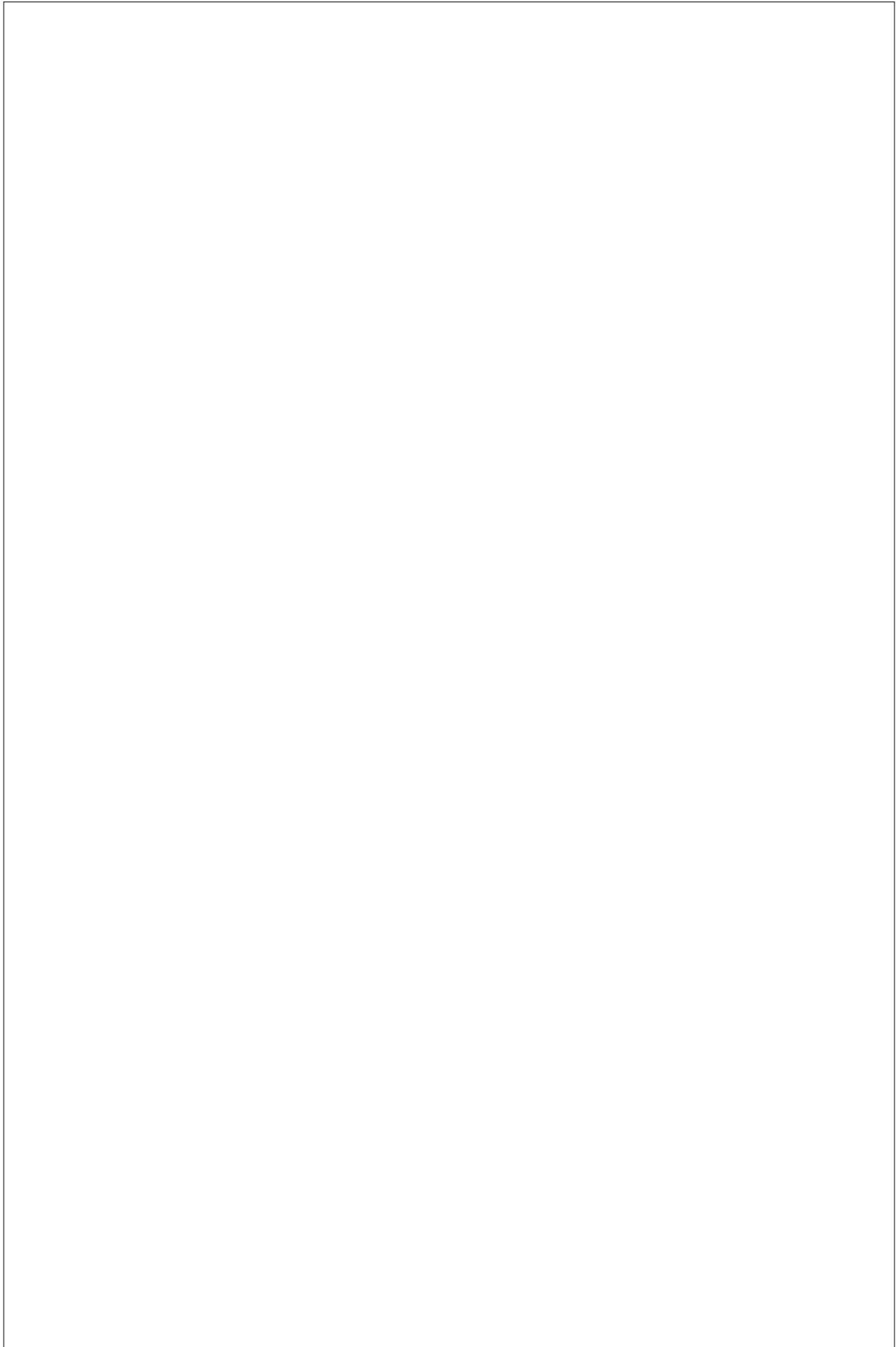
07. $(8\pi/3)(64 - 24\sqrt{3})$

08. $\pi/12$

09. $\frac{\pi}{2}(1 - \cos 9)$

10. $2\sqrt{2}/3$

11. $37.5\pi \approx 118m^3$



11.4 삼중적분

01. $\frac{27}{4}$

02. $\frac{16}{15}$

03. $-\frac{1}{3}$

04. $\frac{27}{2}$

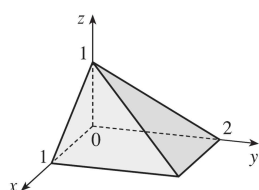
05. $\frac{65}{28}$

06. $\frac{1}{60}$

07. $\frac{16}{3}$

08. $\frac{8}{15}$

09.



10.

$$\begin{aligned} \iiint_E f(x, y, z) dV &= \int_{-2}^2 \int_0^{4-x^2} \int_{-\sqrt{4-x^2-y}/2}^{\sqrt{4-x^2-y}/2} f(x, y, z) dz dy dx = \int_0^4 \int_{-\sqrt{4-y}}^{\sqrt{4-y}} \int_{-\sqrt{4-x^2-y}/2}^{\sqrt{4-x^2-y}/2} f(x, y, z) dz dx dy \\ &= \int_{-1}^1 \int_0^{4-4z^2} \int_{-\sqrt{4-y-4z^2}}^{\sqrt{4-y-4z^2}} f(x, y, z) dx dy dz = \int_0^4 \int_{-\sqrt{4-y}/2}^{\sqrt{4-y}/2} \int_{-\sqrt{4-y-4z^2}}^{\sqrt{4-y-4z^2}} f(x, y, z) dx dz dy \\ &= \int_{-2}^2 \int_{-\sqrt{4-x^2}/2}^{\sqrt{4-x^2}/2} \int_0^{4-x^2-4z^2} f(x, y, z) dy dz dx = \int_{-1}^1 \int_{-\sqrt{4-4z^2}}^{\sqrt{4-4z^2}} \int_0^{4-x^2-4z^2} f(x, y, z) dy dx dz \end{aligned}$$

11.

$$\begin{aligned}\iint_E f(x, y, z) dV &= \int_{-2}^2 \int_{x^2}^4 \int_0^{2-y/2} f(x, y, z) dz dy dx = \int_0^4 \int_{-\sqrt{y}}^{\sqrt{y}} \int_0^{2-y/2} f(x, y, z) dz dx dy \\ &= \int_0^4 \int_0^{2-y/2} \int_{-\sqrt{y}}^{\sqrt{y}} f(x, y, z) dx dz dy = \int_0^2 \int_0^{4-2z} \int_{-\sqrt{y}}^{\sqrt{y}} f(x, y, z) dx dy dz \\ &= \int_{-2}^2 \int_0^{2-x^2/2} \int_{x^2}^{4-2z} f(x, y, z) dy dz dx = \int_0^2 \int_{-\sqrt{4-2z}}^{\sqrt{4-2z}} \int_{x^2}^{4-2z} f(x, y, z) dy dx dz\end{aligned}$$

12.

$$\begin{aligned}\int_0^1 \int_{\sqrt{x}}^1 \int_0^{1-y} f(x, y, z) dz dy dx &= \int_0^1 \int_0^{y^2} \int_0^{1-y} f(x, y, z) dz dx dy = \int_0^1 \int_0^{1-z} \int_0^{y^2} f(x, y, z) dx dy dz \\ &= \int_0^1 \int_0^{1-y} \int_0^{y^2} f(x, y, z) dx dz dy = \int_0^1 \int_0^{1-\sqrt{x}} \int_{\sqrt{x}}^{1-z} f(x, y, z) dy dz dx \\ &= \int_0^1 \int_0^{(1-z)^2} \int_{\sqrt{x}}^{1-z} f(x, y, z) dy dx dz\end{aligned}$$

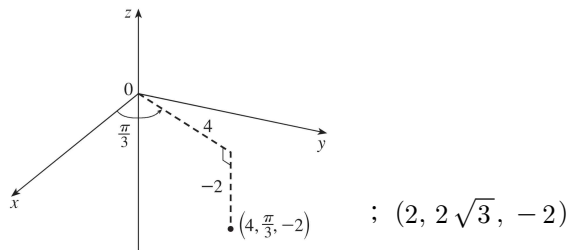
13. 64π

14. $L^3/8$

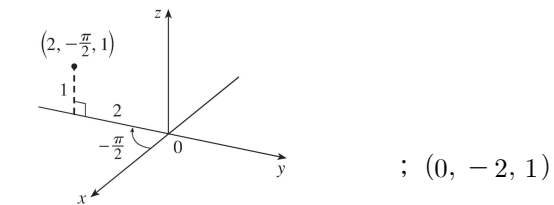
11.5 원기등좌표에서 삼중적분

01.

(a)



(b)



02.

(a) $(\sqrt{2}, 3\pi/4, 1)$

(b) $(4, 2\pi/3, 3)$

03. 생략

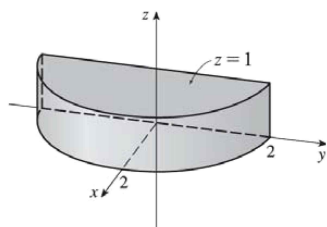
04. 생략

05.

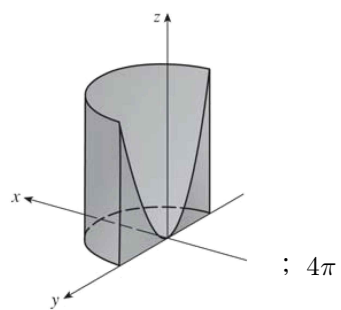
(a) $z^2 = 1 + r \cos \theta - r^2$

(b) $z = r^2 \cos 2\theta$

06.



07.



08. 384π

09. $\frac{8}{3}\pi + \frac{128}{15}$

10. $\frac{2\pi}{5}$

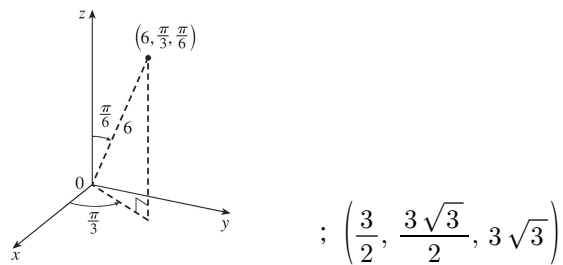
11. $\frac{4}{3}\pi(\sqrt{2}-1)$

12. 0

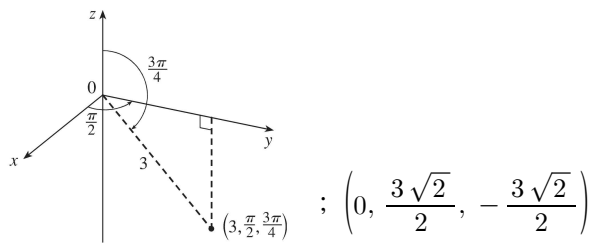
11.6 구면좌표에서 삼중적분

01.

(a)



(b)



02.

(a) $(2, 3\pi/2, \pi/2)$

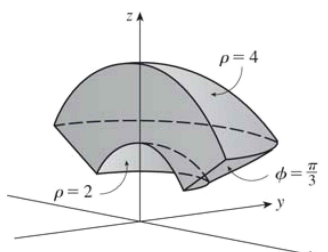
(b) $(2, 3\pi/4, 3\pi/4)$

03.

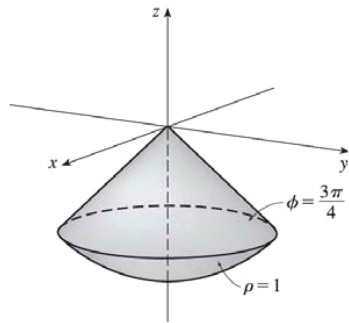
(a) $\cos^2 \phi = \sin^2 \phi$

(b) $\rho^2 (\sin^2 \phi \cos^2 \theta + \cos^2 \phi) = 9$

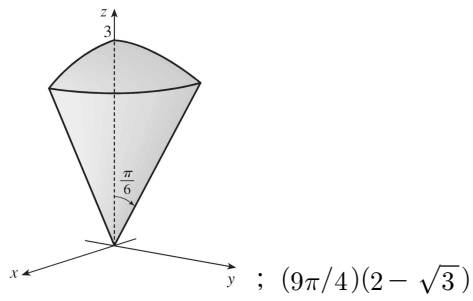
04.



05.



06.



07. $\frac{312500\pi}{7} \approx 140249.7$

08. $\frac{1688\pi}{15}$

09. $\frac{\pi}{8}$

10. 10π

11. $(4\sqrt{2} - 5)/15$

12. $4096\pi/21$

13. 생략

11장 복습문제

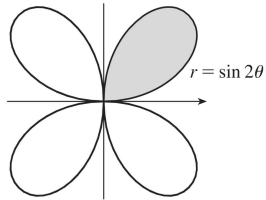
연습문제

01. $4e^2 - 4e + 3$

02. $\frac{2}{3}$

03. $\int_0^\pi \int_2^4 f(r \cos \theta, r \sin \theta) r dr d\theta$

04.



05. $\frac{1}{2} \sin 1$

06. $\frac{1}{2}e^6 - \frac{7}{2}$

07. 8

08. 40.5

09. $\pi/96$

10. 176

11. $\frac{2}{3}$

12. $(\sqrt{3}, 3, 2), (4, \pi/3, \pi/3)$

13. $(2\sqrt{2}, 2\sqrt{2}, 4\sqrt{3}), (4, \pi/4, 4\sqrt{3})$

14. $r^2 + z^2 = 4, \rho = 2$

15. 97.2

16. $\int_0^1 \int_0^{1-z} \int_{-\sqrt{y}}^{\sqrt{y}} f(x, y, z) dx dy dz$