

부록 E 해답

7장

연습문제 7.1

01. $\frac{32}{3}$

02. $e - (1/e) + \frac{10}{3}$

03. $e - (1/e) + \frac{4}{3}$

04. $\frac{1}{6}$

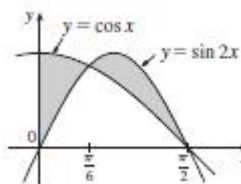
05. $\frac{9}{8}$

06. 72

07. $e - 2$

08. $\frac{32}{3}$

09. $\frac{2}{\pi} + \frac{2}{3}$



10. $\ln 2$

11. $\frac{1}{2}$

12. 2.80123

13. 0.25142

14. 36m

15. 84m^2

16. 8868; 10년 동안 인구의 증가

17. $r\sqrt{R^2 - r^2} + \pi r^2/2 - R^2 \arcsin(r/R)$

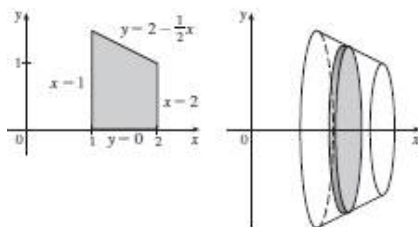
18. ± 6

19. $4^{2/3}$

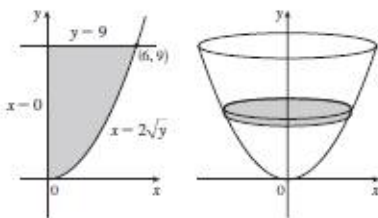
20. $f(t) = 3t^2$

21. $0 < m < 1; m - \ln m - 1$

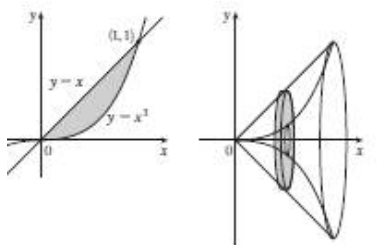
연습문제 7.2



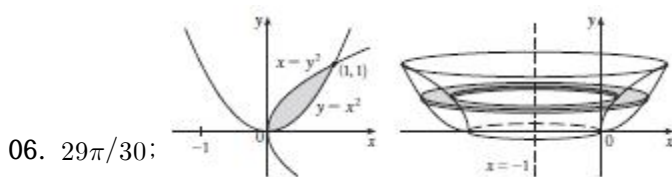
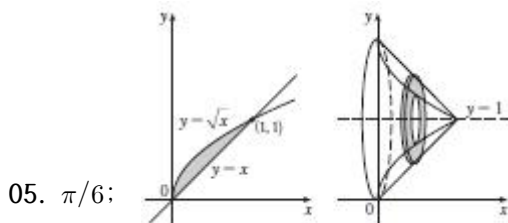
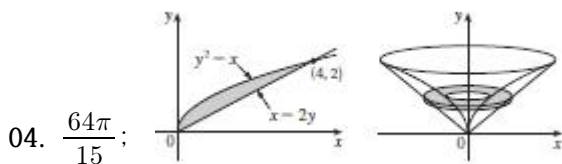
01. $\frac{19\pi}{12}$



02. 162π



03. $\frac{4\pi}{21}$



07. $\pi/2$

08. $108\pi/5$

09. $13\pi/30$

10. (a) $2\pi \int_0^1 e^{-2x^2} dx \approx 3.75825$ (b) $2\pi \int_0^1 (e^{-2x^2} + 2e^{-x^2}) dx \approx 13.14312$

11. (a) $2\pi \int_0^2 8\sqrt{1-x^2/4} dx \approx 78.95684$ (b) $2\pi \int_0^1 8\sqrt{4-4y^2} dy \approx 78.95684$

12. 0, 0.747; 0.132

13. $\frac{11}{8}\pi^2$

14. (a) 영역 $0 \leq y \leq \cos x$, $0 \leq x \leq \pi/2$ 를 x 축에 대하여 회전시켜 얻은 입체

(b) 영역 $y^4 \leq x \leq y^2$, $0 \leq y \leq 1$ 을 y 축에 대하여 회전시켜 얻은 입체

15. 1110cm^3

16. $\frac{1}{3}\pi r^2 h$

17. $\pi h^2 \left(r - \frac{1}{3}h \right)$

18. $\frac{2}{3}b^2 h$

19. 10cm^3

20. 24

21. $\frac{\sqrt{3}}{12}$

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

23. 2

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

25. 생략

26. (a) $8\pi R \int_0^r \sqrt{r^2 - y^2} dy$

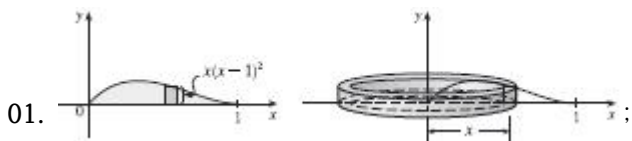
(b) $2\pi^2 r^2 R$

27. (b) $\pi r^2 h$

28. $\frac{5}{12}\pi r^3$

29. $8 \int_0^r \sqrt{R^2 - y^2} \sqrt{r^2 - y^2} dy$

연습문제 7.3



01. 원둘레 = $2\pi x$, 높이 = $x(x-1)^2$; $\pi/15$

02. $6\pi/7$ 03. $\pi(1-1/e)$ 04. 8π 05. 4π 06. $768\pi/7$

07. $16\pi/3$ 08. $7\pi/15$ 09. $8\pi/3$ 10. $5\pi/14$

11. (a) $2\pi \int_0^2 x^2 e^{-x} dx$ (b) 4.06300

12. (a) $4\pi \int_{-\pi/2}^{\pi/2} (\pi-x) \cos^4 x dx$ (b) 46.50942

13. (a) $\int_0^\pi 2\pi(4-y) \sqrt{\sin y} dy$ (b) 36.57476 14. 1.142

15. 영역 $0 \leq y \leq x^4$, $0 \leq x \leq 3$ 을 y 축에 대하여 회전시켜 얻은 입체

16. 영역 (i) $x = 1 - y^2$, $x = 0$, $y = 0$ 또는 (ii) $x = y^2$, $x = 1$, $y = 0$ 을 직선 $y = 3$ 에 대하여 회전시켜 얻은 입체

17. 8π

18. $4\sqrt{3}\pi$

19. $4\pi/3$

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

21. $2\pi^2 R r^2$

22. $\frac{1}{3}\pi r^2 h$

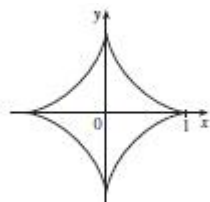
23. 생략

연습문제 7.4

01. $3\sqrt{10}$ 02. 3.8202 03. 3.6095 04. $\frac{2}{243}(82\sqrt{82}-1)$ 05. $\frac{59}{24}$

06. $\frac{32}{3}$ 07. $\ln(\sqrt{2}+1)$ 08. $\frac{3}{4} + \frac{1}{2}\ln 2$ 09. $\ln 3 - \frac{1}{2}$ 10. 10.0556

11. 15.49805; 15.374568 12. 7.094570; 7.118819 13. $\ln 3 - \frac{1}{2}$



14. ; 6

15. $s(x) = \frac{2}{27} [(1+9x)^{3/2} - 10\sqrt{10}]$

16. $2\sqrt{2}(\sqrt{1+x}-1)$

17. 209.1 m

18. 62.55 cm

연습문제 7.5

01. (a) (i) $\int_0^{\pi/3} 2\pi \tan x \sqrt{1 + \sec^4 x} dx$ (ii) $\int_0^{\pi/3} 2\pi x \sqrt{1 + \sec^4 x} dx$
 (b) (i) 10.5017 (ii) 7.9353
02. (a) (i) $\int_{-1}^1 2\pi e^{-x^2} \sqrt{1 + 4x^2 e^{-2x^2}} dx$ (ii) $\int_0^1 2\pi x \sqrt{1 + 4x^2 e^{-2x^2}} dx$
 (b) (i) 11.0753 (ii) 3.9603
03. $\frac{1}{27}\pi(145\sqrt{145} - 1)$ 04. $\frac{98}{3}\pi$ 05. $2\sqrt{1 + \pi^2} + (2/\pi) \ln(\pi + \sqrt{1 + \pi^2})$
06. $\frac{21}{2}\pi$ 07. $\frac{1}{27}\pi(145\sqrt{145} - 10\sqrt{10})$ 08. πa^2
09. $\frac{1}{6}\pi [\ln(\sqrt{10} + 3) + 3\sqrt{10}]$ 10. (a) $\frac{1}{3}\pi a^2$ (b) $\frac{56}{45}\pi\sqrt{3}a^2$
11. (a) $2\pi \left[b^2 + \frac{a^2 b \sin^{-1}(\sqrt{a^2 - b^2}/a)}{\sqrt{a^2 - b^2}} \right]$ (b) $2\pi a^2 + \frac{2\pi ab^2}{\sqrt{a^2 - b^2}} \ln \frac{a + \sqrt{a^2 - b^2}}{b}$
12. $4\pi^2 Rr$ 13. $\int_a^b 2\pi [c - f(x)] \sqrt{1 + [f'(x)]^2} dx$
14. ≈ 80.6095 15. $4\pi^2 r^2$ 16. 생략

연습문제 7.6

01. 4.5 ft·lb 02. 180 J 03. $\frac{15}{4}$ ft·lb 04. (a) $\frac{25}{24} \approx 1.04$ J (b) 10.8 cm
05. 8 cm 06. (a) 625 ft·lb (b) $\frac{1875}{4}$ ft·lb 07. 650000 ft·lb
08. 3857 J 09. 2450 J 10. (a) $\approx 1.06 \times 10^6$ J (b) 2.0 m
11. 생략
12. $\approx 8.50 \times 10^9$ J 13. (a) $Gm_1m_2\left(\frac{1}{a} - \frac{1}{b}\right)$ (b) $\approx 8.50 \times 10^9$ J
14. 62.5 ft·lb 15. $\sqrt{2GM/R}$ 16. 6000 lb
17. 6.7×10^4 N 18. 9.8×10^3 N 19. 5.27×10^5 N
20. (a) 4.9×10^4 N (b) $\approx 4.4 \times 10^5$ N (c) $\approx 4.2 \times 10^5$ N (d) $\approx 3.9 \times 10^6$ N
21. 4148 lb 22. 10; 14; (1.4, 1) 23. $\left(\frac{2}{3}, \frac{2}{3}\right)$ 24. $\left(\frac{1}{e-1}, \frac{e+1}{4}\right)$
25. $\left(\frac{9}{20}, \frac{9}{20}\right)$ 26. $\left(\frac{\pi\sqrt{2}-4}{4(\sqrt{2}-1)}, \frac{1}{4(\sqrt{2}-1)}\right)$ 27. 60; 160; $\left(\frac{8}{3}, 1\right)$
28. 생략 29. $\left(\frac{1}{12}, \frac{5}{6}\right)$ 30. $\left(0, \frac{1}{12}\right)$
31. $\frac{1}{3}\pi r^2 h$ 32. 생략

연습문제 7.7

01. $y = Kx$

02. $y = \sqrt[3]{3x + 3 \ln|x| + K}$

03. $\frac{1}{2}y^2 - \cos y = \frac{1}{2}x^2 + \frac{1}{4}x^4 + C$

04. $p = Ke^{t^{3/3-t}} - 1$

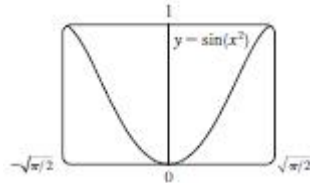
05. $y = -\sqrt{x^2 + 9}$

06. $u = -\sqrt{t^2 + \tan t + 25}$

07. $y = \frac{4a}{\sqrt{3}} \sin x - a$

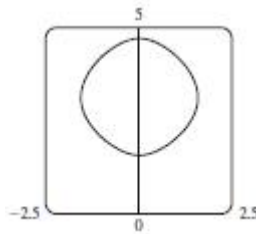
08. $y = e^{x^2/2}$

09. (a) $\sin^{-1} y = x^2 + C$



(b) $y = \sin(x^2), -\sqrt{\pi/2} \leq x \leq \sqrt{\pi/2}$

(c) 갖지 않는다.



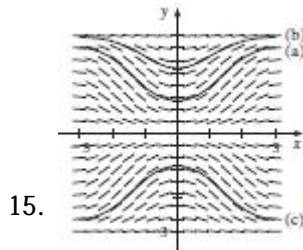
10. $\cos y = \cos x - 1$

11. III

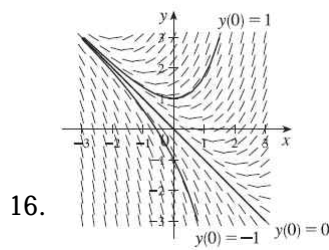
12. I

13. IV

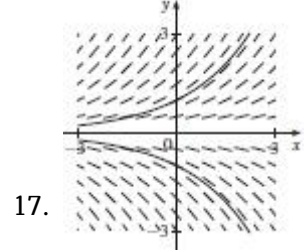
14. II



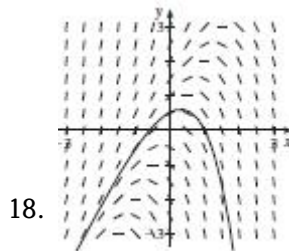
15.



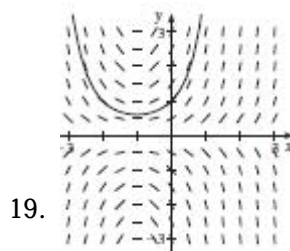
16.



17.



18.



19.

20. (a) 생략 (b) $P(t) = M - Me^{-kt}$; M

21. (a) $C(t) = (C_0 - r/k)e^{-kt} + r/k$

(b) r/k ; C_0 의 값에 무관하게 농도는 r/k 로 접근한다.

22. $P(40) \approx 732$, $P(80) \approx 985$; $t \approx 55$

23. (a) $dy/dx = ky(1-y)$ (b) $y = \frac{y_0}{y_0 + (1-y_0)e^{-kt}}$ (c) 오후 3시 36분

24. 생략 25. (a) $15e^{-t/100}$ kg (b) $15e^{-0.2} \approx 12.3$ kg

26. 약 4.9% 27. g/k

28. (a) $dA/dt = k\sqrt{A}(M-A)$

(b) $A(t) = M \left(\frac{Ce^{\sqrt{M}kt} - 1}{Ce^{\sqrt{M}kt} + 1} \right)^2$, 여기서 $C = \frac{\sqrt{M} + \sqrt{A_0}}{\sqrt{M} - \sqrt{A_0}}$ 이고 $A_0 = A(0)$ 이다.

7장 복습문제

연습문제

01. $\frac{8}{3}$

02. $\frac{7}{12}$

03. $\frac{64}{15}\pi$

04. $\frac{1656}{5}\pi$

05. $\frac{4}{3}\pi(2ah + h^2)^{3/2}$

06. $\int_{-\pi/3}^{\pi/3} 2\pi(\pi/2 - x) \left(\cos^2 x - \frac{1}{4} \right) dx$

07. (a) $2\pi/15$ (b) $\pi/6$ (c) $8\pi/15$ 08. (a) 0.38 (b) 0.87

09. 영역 $0 \leq y \leq \cos x$, $0 \leq x \leq \pi/2$ 를 y 축에 대하여 회전시켜 얻은 입체

10. 영역 $0 \leq x \leq \pi$, $0 \leq y \leq 2 - \sin x$ 를 x 축에 대하여 회전시켜 얻은 입체

11. 36

12. $\frac{125}{3}\sqrt{3} \text{ m}^3$

13. $\frac{15}{2}$

14. (a) $\frac{21}{16}$ (b) $\frac{41}{10}\pi$

15. 3.8202

16. 14.4260

17. $\frac{124}{5}$

18. $\frac{4088}{9}\pi$

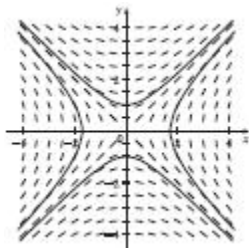
19. 3.2 J

20. (a) $8000\pi/3 \approx 8378 \text{ ft}\cdot\text{lb}$ (b) 2.1 ft 21. 6533 N 22. $\left(\frac{8}{5}, 1\right)$

23. $2\pi^2$

24. $y = \pm \sqrt{\ln(x^2 + 2x^{3/2} + C)}$

25. $r(t) = 5e^{t-t^2}$



26. (a)

(b) $C = 0$ 에 대해 직선의 쌍 $y = \pm x$; $C \neq 0$ 에 대해 쌍곡선 $x^2 - y^2 = -C$