

부록 E 해답

6장

연습문제 6.1

01. $\frac{1}{3}x^3 \ln x - \frac{1}{9}x^3 + C$ 02. $\frac{1}{5}x \sin 5x + \frac{1}{25} \cos 5x + C$
03. $-\frac{1}{3}te^{-3t} - \frac{1}{9}e^{-3t} + C$
04. $(x^2 + 2x) \sin x + (2x + 2) \cos x - 2 \sin x + C$
05. $\frac{1}{2}(2x + 1) \ln(2x + 1) - x + C$ 06. $t \arctan 4t - \frac{1}{8} \ln(1 + 16t^2) + C$
07. $\frac{1}{13}e^{2\theta}(2 \sin 3\theta - 3 \cos 3\theta) + C$ 08. $\frac{e^{2x}}{4(2x + 1)} + C$ 09. $\frac{\pi - 2}{2\pi^2}$
10. $\frac{81}{4} \ln 3 - 5$ 11. $1 - 1/e$ 12. $\frac{1}{6}(\pi + 6 - 3\sqrt{3})$
13. $2(\ln 2)^2 - 4 \ln 2 + 2$ 14. $2\sqrt{x} \sin \sqrt{x} + 2 \cos \sqrt{x} + C$ 15. $-\frac{1}{2} - \frac{\pi}{4}$
16. (a) 생략 (b) $-\frac{1}{4} \cos x \sin^3 x + \frac{3}{8}x - \frac{3}{16} \sin 2x + C$
17. (a) 생략 (b) $\frac{2}{3}, \frac{8}{15}$ 18. 생략 19.~20. 생략
21. $x[(\ln x)^3 - 3(\ln x)^2 + 6 \ln x - 6] + C$
22. $1 - (2/\pi) \ln 2$ 23. $2 - e^{-t}(t^2 + 2t + 2) \text{ m}$ 24. 2

연습문제 6.2

01. $\frac{1}{3} \sin^3 x - \frac{1}{5} \sin^5 x + C$ 02. $\frac{1}{120}$ 03. $\pi/4$ 04. $3\pi/8$
05. $\pi/16$ 06. $\frac{1}{4}t^2 - \frac{1}{4}t \sin 2t - \frac{1}{8} \cos 2t + C$
07. $\frac{1}{2} \cos^2 x - \ln |\cos x| + C$ 08. $\ln(1 + \sin x) + C$
09. $\frac{1}{3} \sec^3 x + C$ 10. $\tan x - x + C$
11. $\frac{1}{9} \tan^9 x + \frac{2}{7} \tan^7 x + \frac{1}{5} \tan^5 x + C$ 12. $\frac{117}{8}$
13. $\frac{1}{3} \sec^3 x - \sec x + C$ 14. $\frac{1}{4} \sec^4 x - \tan^2 x + \ln |\sec x| + C$
15. $\sqrt{3} - \frac{\pi}{3}$ 16. $\frac{22}{105} \sqrt{2} - \frac{8}{105}$ 17. $\ln |\csc x - \cot x| + C$

18. $\frac{1}{2}\sqrt{2}$ 19. (a) 생략 (b) $\frac{1}{6}\sin 3x - \frac{1}{14}\sin 7x + C$
20. $-\frac{\sqrt{4-x^2}}{4x} + C$ 21. $\sqrt{x^2-4} - 2\sec^{-1}\left(\frac{x}{2}\right) + C$
22. $\frac{\pi}{24} + \frac{\sqrt{3}}{8} - \frac{1}{4}$ 23. $\frac{1}{\sqrt{2}a^2}$ 24. $\ln(\sqrt{x^2+16} + x) + C$
25. $\frac{1}{4}\sin^{-1}(2x) + \frac{1}{2}x\sqrt{1-4x^2} + C$ 26. $\frac{1}{6}\sec^{-1}(x/3) - \frac{\sqrt{x^2-9}}{2x^2} + C$
27. $\frac{9}{500}\pi$ 28. $\sqrt{x^2-7} + C$
29. $\ln|(\sqrt{1+x^2}-1)/x| + \sqrt{1+x^2} + C$ 30. $\frac{1}{4}\sin^{-1}(x^2) + \frac{1}{4}x^2\sqrt{1-x^4} + C$
31. $\frac{1}{3}\ln|3x+1+\sqrt{9x^2+6x-8}| + C$
32. $\frac{9}{2}\sin^{-1}((x-2)/3) + \frac{1}{2}(x-2)\sqrt{5+4x-x^2} + C$
33. $s = (1 - \cos^3 \omega t)/(3\omega)$ 34. $\frac{1}{6}(\sqrt{48} - \sec^{-1} 7)$ 35 생략

연습문제 6.3

01. (a) $\frac{A}{4x-3} + \frac{B}{2x+5}$ (b) $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{5-2x}$
02. (a) $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{Dx+E}{x^2+4}$ (b) $\frac{A}{x+3} + \frac{B}{(x+3)^2} + \frac{C}{x-3} + \frac{D}{(x-3)^2}$
03. (a) $x^4 + 4x^2 + 16 + \frac{A}{x+2} + \frac{B}{x-2}$ (b) $\frac{Ax+B}{x^2-x+1} + \frac{Cx+D}{x^2+2} + \frac{Ex+F}{(x^2+2)^2}$
04. $\frac{1}{4}x^4 + \frac{1}{3}x^3 + \frac{1}{2}x^2 + x + \ln|x-1| + C$ 05. $\frac{1}{2}\ln|2x+1| + 2\ln|x-1| + C$
06. $2\ln\frac{3}{2}$ 07. $a\ln|x-b| + C$ 08. $2\ln 2 + \frac{1}{2}$
09. $\frac{27}{5}\ln 2 - \frac{9}{5}\ln 3$ 또는 $\frac{9}{5}\ln\frac{8}{3}$ 10. $10\ln|x-3| - 9\ln|x-2| + \frac{5}{x-2} + C$
11. $\frac{1}{2}x^2 - 2\ln(x^2+4) + 2\tan^{-1}(x/2) + C$
12. $\ln|x-1| - \frac{1}{2}\ln(x^2+9) - \frac{1}{3}\tan^{-1}(x/3) + C$
13. $\frac{1}{2}\ln(x^2+1) + \frac{1}{\sqrt{2}}\tan^{-1}(x/\sqrt{2}) + C$
14. $\frac{1}{2}\ln(x^2+2x+5) + \frac{3}{2}\tan^{-1}\left(\frac{x+1}{2}\right) + C$

15. $\frac{1}{3} \ln |x-1| - \frac{1}{6} \ln (x^2+x+1) - \frac{1}{\sqrt{3}} \tan^{-1} \frac{2x+1}{\sqrt{3}} + C$
16. $\frac{1}{16} \ln |x| - \frac{1}{32} \ln (x^2+4) + \frac{1}{8(x^2+4)} + C$
17. $\frac{-1}{2(x^2+2x+4)} - \frac{2\sqrt{3}}{9} \tan^{-1} \left(\frac{x+1}{\sqrt{3}} \right) - \frac{2(x+1)}{3(x^2+2x+4)} + C$
18. $2 + \ln \frac{25}{9}$ 19. $\frac{3}{10}(x^2+1)^{5/3} - \frac{3}{4}(x^2+1)^{2/3} + C$ 20. $\ln \left[\frac{(e^x+2)^2}{e^x+1} \right] + C$
21. $\left(x - \frac{1}{2} \right) \ln (x^2-x+2) - 2x + \sqrt{7} \tan^{-1} \left(\frac{2x-1}{\sqrt{7}} \right) + C$
22. $t = -\ln P - \frac{1}{9} \ln (0.9P + 900) + C$, 여기서 $C \approx 10.23$ 23. 생략
24. $\frac{1}{a^n(x-a)} - \frac{1}{a^n x} - \frac{1}{a^{n-1}x^2} - \dots - \frac{1}{ax^n}$

연습문제 6.4

01. $\frac{\pi}{8} \arctan \frac{\pi}{4} - \frac{1}{4} \ln \left(1 + \frac{\pi^2}{16} \right)$ 02. $\frac{1}{6} \ln \left| \frac{\sin x - 3}{\sin x + 3} \right| + C$
03. $-\sqrt{4x^2+9}/(9x) + C$ 04. $\pi^3 - 6\pi$
05. $-\frac{1}{2} \tan^2(1/z) - \ln |\cos(1/z)| + C$
06. $\frac{2y-1}{8} \sqrt{6+4y-4y^2} + \frac{7}{8} \sin^{-1} \left(\frac{2y-1}{\sqrt{7}} \right) - \frac{1}{12} (6+4y-4y^2)^{3/2} + C$
07. $\frac{1}{9} \sin^3 x [3 \ln (\sin x) - 1] + C$ 08. $\frac{1}{2\sqrt{3}} \ln \left| \frac{e^x + \sqrt{3}}{e^x - \sqrt{3}} \right| + C$
09. $\frac{1}{5} \ln |x^5 + \sqrt{x^{10}-2}| + C$
10. $\frac{1}{2} (\ln x) \sqrt{4+(\ln x)^2} + 2 \ln [\ln x + \sqrt{4+(\ln x)^2}] + C$
11. $\sqrt{e^{2x}-1} - \cos^{-1}(e^{-x}) + C$ 12. 생략
13. $\frac{1}{3} \tan x \sec^2 x + \frac{2}{3} \tan x + C$
14. $\frac{1}{4} x(x^2+2) \sqrt{x^2+4} - 2 \ln (\sqrt{x^2+4} + x) + C$
15. $\frac{1}{4} \cos^3 x \sin x + \frac{3}{8} \sin x \cos x + C$
16. $\frac{1}{4} \tan^4 x - \frac{1}{2} \tan^2 x - \ln |\cos x| + C$

17. (a) $-\ln \left| \frac{1 + \sqrt{1-x^2}}{x} \right| + C$; 둘다 정의역이 $(-1, 0) \cup (0, 1)$ 이다. (b) 생략

연습문제 6.5

01. (a) $L_2 = 6$, $R_2 = 12$, $M_2 \approx 9.6$ (b) L_2 는 과소평가되고 R_2 와 M_2 는 과대평가된다.

(c) $T_2 = 9 < I$ (d) $L_n < T_n < I < M_n < R_n$

02. (a) $T_4 \approx 0.895759$ (과소평가) (b) $M_4 \approx 0.908907$ (과대평가), $T_4 < I < M_4$

03. (a) $M_{10} \approx 0.806598$, $E_M \approx -0.001879$ (b) $S_{10} \approx 0.804779$, $E_S \approx -0.000060$

04. (a) 1.506361 (b) 1.518362 (c) 1.511519

05. (a) 2.660833 (b) 2.664377 (c) 2.663244

06. (a) 4.513618 (b) 4.748256 (c) 4.675111

07. (a) -0.495333 (b) -0.543321 (c) -0.526123

08. (a) 1.064275 (b) 1.067416 (c) 1.074915

09. (a) $T_8 \approx 0.902333$, $M_8 \approx 0.905620$ (b) $|E_T| \leq 0.0078$, $|E_M| \leq 0.0039$

(c) T_n 에 대해 $n = 71$, M_n 에 대해 $n = 50$

10. (a) $T_{10} \approx 1.983524$, $E_T \approx 0.016476$; $M_{10} \approx 2.008248$, $E_M \approx -0.008248$;

$S_{10} \approx 2.000110$, $E_S \approx -0.000110$;

(b) $|E_T| \leq 0.025839$, $|E_M| \leq 0.012919$, $|E_S| \leq 0.000170$

(c) T_n 에 대해 $n = 509$, M_n 에 대해 $n = 360$, S_n 에 대해 $n = 22$

11. (a) 2.8 (b) 7.954926518 (c) 0.2894 (d) 7.954926521

(e) 실제 오차는 더 작다. (f) 10.9 (g) 7.953789422 (h) 0.0593

(i) 실제 오차는 더 작다. (j) $n \geq 50$

12.

n	L_n	R_n	T_n	M_n
5	0.742943	1.286599	1.014771	0.992621
10	0.867782	1.139610	1.003696	0.998152
20	0.932967	1.068881	1.000924	0.999538

n	E_L	E_R	E_T	E_M
5	0.257057	-0.286599	-0.014771	0.007379
10	0.132218	-0.139610	-0.003696	0.001848
20	0.067033	-0.068881	-0.000924	0.000462

관찰한 결과 [예제 1] 이후와 동일하다.

13.

n	T_n	M_n	S_n
6	2.008966	1.995572	2.000469
12	2.002269	1.998869	2.000036

n	E_T	E_M	E_S
6	-0.008966	0.004428	-0.000469
12	-0.002269	0.001131	-0.000036

14. (a) 19.8 (b) 20.6 (c) $20.5\bar{3}$

15. 18.8 m/s

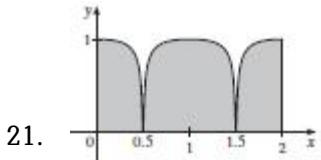
16. 64.4°F

17. (a) 14.4 (b) $\frac{1}{2}$

18. $1.0377 \times 10^5 \text{ MW/h}$

19. $T \approx 2.07665$

20. 59.4



22.~24. 생략

연습문제 6.6

01. (a), (d) 무한대인 불연속점 (b), (c) 무한구간

02. $\frac{1}{2} - \frac{1}{2t^2}$; 0.495, 0.49995, 0.4999995, 0.5

03. 2

04. 발산

05. $\frac{1}{5}e^{-10}$

06. 발산

07. 0

08. $-\frac{1}{4}$

09. 발산

10. $\ln 2$

11. $\pi/9$

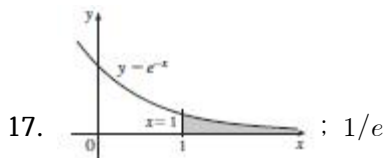
12. 발산

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

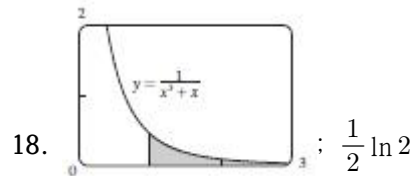
14. $\frac{9}{2}$

15. 발산

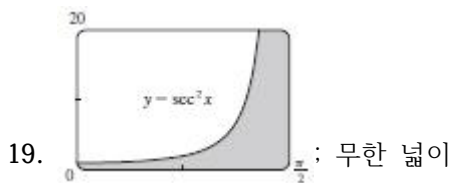
16. $\frac{8}{3} \ln 2 - \frac{8}{9}$



; $1/e$



; $\frac{1}{2} \ln 2$



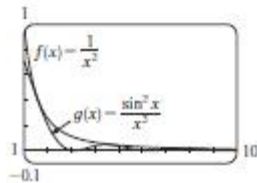
; 무한 넓이

t	$\int_1^t [(\sin^2 x)/x^2] dx$
2	0.447453
5	0.577101
10	0.621306
100	0.668479
1000	0.672957
10000	0.673407

20. (a) ; 적분이 수렴하는 것으로 보인다.

(b) 20.6

(c)



21. 수렴

22. 발산

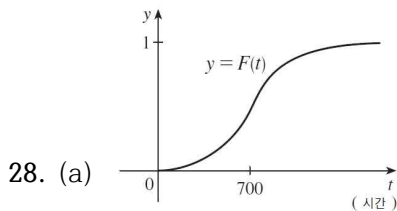
23. 발산

24. π

25. $p < 1, 1/(1-p)$

26. 생략

27. 생략



28. (a)

(b) t 가 증가할 때, 함수 $F(t)$ 가 증가하는 비율

(c) 1 ; 모든 전구가 결국 꺼진다.

29. 8264.5년

30. 1000

31. 생략

32. $C = 1; \ln 2$

33. 생략

34. 아니다.

6장 복습문제

참-거짓 질문

01. 거짓 02. 거짓 03. 거짓 04. 거짓 05. (a) 참 (b) 거짓 06. 거짓
07. 거짓

연습문제

01. $\frac{7}{2} + \ln 2$ 02. $e - 1$ 03. $\ln |2t + 1| - \ln |t + 1| + C$
04. $-\cos(\ln t) + C$ 05. $\frac{64}{5} \ln 4 - \frac{124}{25}$ 06. $\sqrt{3} - (\pi/3)$
07. $\ln |x| - \frac{1}{2} \ln(x^2 + 1) + C$ 08. $\frac{2}{15}$ 09. $x \sec x - \ln |\sec x + \tan x| + C$

10. $\frac{1}{18} \ln(9x^2 + 6x + 5) + \frac{1}{9} \tan^{-1}\left(\frac{1}{2}(3x + 1)\right) + C$
11. $\ln|x - 2 + \sqrt{x^2 - 4x}| + C$ 12. $-\frac{1}{12}(\cot^3 4x + 3 \cot 4x) + C$
13. $\frac{3}{2} \ln(x^2 + 1) - 3 \tan^{-1} x + \sqrt{2} \tan^{-1}(x/\sqrt{2}) + C$
14. $\frac{2}{5}$ 15. 0 16. $6 - \frac{3}{2}\pi$ 17. $\frac{x}{\sqrt{4-x^2}} - \sin^{-1}\left(\frac{x}{2}\right) + C$
18. $4\sqrt{1+\sqrt{x}} + c$ 19. $\frac{1}{2} \sin 2x - \frac{1}{8} \cos 4x + C$ 20. $\frac{1}{8}e - \frac{1}{4}$
21. $\frac{1}{36}$ 22. 발산 23. $4 \ln 4 - 8$ 24. $-\frac{4}{3}$ 25. $\pi/4$
26. $\frac{1}{4}(2x - 1)\sqrt{4x^2 - 4x - 3} - \ln|2x - 1 + \sqrt{4x^2 - 4x - 3}| + C$
27. $\frac{1}{2} \sin x \sqrt{4 + \sin^2 x} + 2 \ln(\sin x + \sqrt{4 + \sin^2 x}) + C$ 28. 아니다.
29. (a) 1.925444 (b) 1.920915 (c) 1.922470
30. (a) 0.01348, $n \geq 368$ (b) 0.00674, $n \geq 260$
31. 13.7 km
32. (a) 3.8 (b) 1.7867, 0.000646 (c) $n \geq 30$ 33. 생략
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