

연습문제 해답

게시 일자 : 2018-04-19

6장

적분법

6.1 부분적분법

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. $(x^2 + 2x) \sin x + (2x + 2) \cos x - 2 \sin x + C$

04. $t \arctan 4t - \frac{1}{8} \ln(1 + 16t^2) + C$

05. $\frac{e^{2x}}{4(2x+1)} + C$

06. $\frac{81}{4} \ln 3 - 5$

07. $\frac{1}{6}(\pi + 6 - 3\sqrt{3})$

08. $2\sqrt{x} \sin \sqrt{x} + 2\cos \sqrt{x} + C$

09. $-\frac{1}{2} - \frac{\pi}{4}$

10. 생략

11. 생략

12. $x(\ln x)^3 - 3x(\ln x)^2 + 6x \ln x - 6x + C$

13. $1 - \frac{2}{\pi} \ln 2$

14. $2 - e^{-t}(t^2 + 2t + 2)$ m

15. 2

6.2 삼각함수 적분과 삼각치환법

01. $\frac{1}{3} \sin^3 x - \frac{1}{5} \sin^5 x + C$

02. $\frac{\pi}{4}$

03. $\frac{\pi}{16}$

04. $\frac{1}{2} \cos^2 x - \ln |\cos x| + C$

05. $\frac{1}{3} \sec^3 x + C$

06. $\frac{1}{9} \tan^9 x + \frac{2}{7} \tan^7 x + \frac{1}{5} \tan^5 x + C$

07. $\frac{1}{3} \sec^3 x - \sec x + C$

08. $\sqrt{3} - \frac{\pi}{3}$

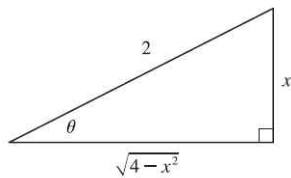
09. $\frac{1}{2} \sqrt{2}$

10.

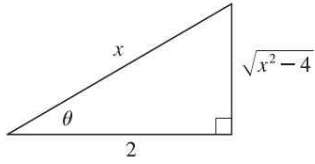
(a) 생략

(b) $\frac{1}{6} \sin 3x - \frac{1}{14} \sin 7x + C$

11. $-\frac{\sqrt{4-x^2}}{4x} + C$



12. $\sqrt{x^2 - 4} - 2 \sec^{-1}\left(\frac{x}{2}\right) + C$



13. $\frac{\pi}{24} + \frac{\sqrt{3}}{8} - \frac{1}{4}$

14. $\frac{1}{\sqrt{2} a^2}$

15. $\ln(\sqrt{x^2 + 16} + x) + C$

16. $\frac{9}{500}\pi$

17. $\ln\left|\frac{\sqrt{1+x^2}-1}{x}\right| + \sqrt{1+x^2} + C$

18. $\frac{1}{4} \sin^{-1}(x^2) + \frac{1}{4} x^2 \sqrt{1-x^4} + C$

19. $\frac{1}{3} \ln|3x+1+\sqrt{9x^2+6x-8}| + C$

20. $s = \frac{1}{3w}(1 - \cos^3 wt)$

21. $\frac{1}{6}(\sqrt{48} - \sec^{-1} 7)$

22. 생략

6.3 부분분수법

01. $\frac{1}{4}x^4 + \frac{1}{3}x^3 + \frac{1}{2}x^2 + x + \ln|x-1| + C$

02. $\frac{1}{2}\ln|2x+1| + 2\ln|x-1| + C$

03. $2\ln\frac{3}{2}$

04. $a\ln|x-b| + C$

05. $2\ln 2 + \frac{1}{2}$

06. $\frac{9}{5}\ln\frac{8}{3}$

07. $10\ln|x-3| - 9\ln|x-2| + \frac{5}{x-2} + C$

08. $\frac{1}{2}x^2 - 2\ln(x^2+4) + 2\tan^{-1}\left(\frac{x}{2}\right) + C$

09. $\ln|x-1| - \frac{1}{2}\ln(x^2+9) - \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + C$

10. $\frac{1}{2}\ln(x^2+1) + \frac{1}{\sqrt{2}}\tan^{-1}\frac{x}{\sqrt{2}} + C$

11. $\frac{1}{2}\ln(x^2+2x+5) + \frac{3}{2}\tan^{-1}\left(\frac{x+1}{2}\right) + C$

12. $\frac{1}{3}\ln|x-1| - \frac{1}{6}\ln(x^2+x+1) - \frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{2x+1}{\sqrt{3}}\right) + C$

13. $\frac{1}{16}\ln|x| - \frac{1}{32}\ln(x^2+4) + \frac{1}{8(x^2+4)} + C$

14. $\frac{-1}{2(x^2+2x+4)} - \frac{2\sqrt{3}}{9}\tan^{-1}\left(\frac{x+1}{\sqrt{3}}\right) - \frac{2(x+1)}{3(x^2+2x+4)} + C$

15. $2 + \ln \frac{25}{9}$

16. $\ln \frac{(e^x + 2)^2}{e^x + 1} + C$

17. $\left(x - \frac{1}{2}\right) \ln(x^2 - x + 2) - 2x + \sqrt{7} \tan^{-1} \frac{2x-1}{\sqrt{7}} + C$

18. $t = \ln \frac{10000}{P} + \frac{1}{9} \ln \frac{11000}{P+1000}$

6.4 근사 적분

01.

- (a) $L_2 = 6$, $R_2 = 12$, $M_2 \approx 9.6$
- (b) L_2 는 과소 추정, R_2 , M_2 는 과대 추정
- (c) $T_2 = 9 < I$
- (d) $L_n < T_n < I < M_n < R_n$

02.

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

03.

- (a) 2.660833
- (b) 2.664377
- (c) 2.663244

04.

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

05.

- (a) $T_{10} \approx 1.983524$, $M_{10} \approx 2.008248$, $S_{10} \approx 2.000110$
 $E_T \approx 0.016476$, $E_M \approx -0.008248$, $E_s \approx -0.000110$
- (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 $n=22$

06.

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

관찰 결과는 [예제1]의 [표 2] 이후와 동일하다.

07. 18.8 m/s

08. 2.07665

09. 59.4

6.5 이상적분

01.

- (a) $x=1$ 에서 무한 불연속
- (b) 무한 구간
- (c) 무한 구간
- (d) $x=0$ 에서 무한 불연속

02.

$$A(t) = \frac{1}{2} - \frac{1}{2t^2}$$

$$A(10)=0.495, A(100)=0.49995, A(1000)=0.4999995$$

$$\lim_{t \rightarrow \infty} A(t) = \frac{1}{2}$$

03. 수렴; 2

04. 수렴; $\frac{1}{5}e^{-10}$

05. 수렴; 0

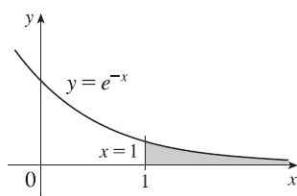
06. 발산

07. 수렴; $\frac{\pi}{9}$

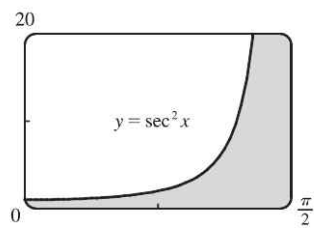
08. 수렴; $\frac{32}{3}$

09. 발산

10. $1/e$



11.



12. 수렴

13. 발산

14. π

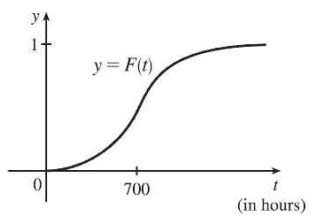
15. $p < 1, \frac{1}{1-p}$

16. 생략

17. 생략

18.

(a)



(b) t 가 증가할 때 함수 $F(t)$ 가 증가하는 비율

(c) 1; 모든 전구가 결국 켜진다.

19. $a > 1000$

20. 생략

21. 생략

22. $C=1; \ln 2$

6장 복습문제

연습문제

01. $\frac{7}{2} + \ln 2$

02. $e - 1$

03. $\ln|2t+1| - \ln|t+1| + C$

04. $-\cos(\ln t) + C$

05. $\frac{128}{5} \ln 2 - \frac{124}{25}$

06. $\sqrt{3} - \frac{\pi}{3}$

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. $\ln \left| x - 2 + \sqrt{x^2 - 4x} \right| + C$

12. $-\frac{1}{12}(\cot^3 4x + 3 \cot 4x) + C$

13. $\frac{3}{2} \ln(x^2 + 1) - 3 \tan^{-1} x + \sqrt{2} \tan^{-1} \left(\frac{x}{\sqrt{2}} \right) + C$

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

15. 0

16. $6 - \frac{3\pi}{2}$

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. 가능하지 않다.

26.

(a) 1.925444

(b) 1.920915

(c) 1.922470

27. 13.7km

28.

(a) 3.8

(b) 1.786721; 0.000646

(c) $n \geq 30$

29. 생략