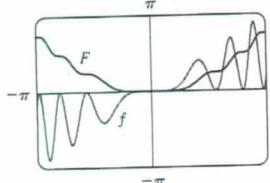


51.  $\frac{1}{4}x^2 - \frac{1}{4}\sin(x^2)\cos(x^2) + C$

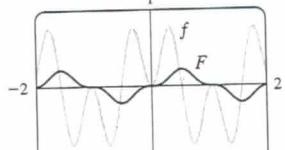


55. 0

57. 1

59. 0

53.  $\frac{1}{6}\sin 3x - \frac{1}{18}\sin 9x + C$



61.  $\pi^2/4$

63.  $\pi(2\sqrt{2} - \frac{5}{2})$

65.  $s = (1 - \cos^3\omega t)/(3\omega)$

## EXERCISES 7.3 • PAGE 472

1.  $\sqrt{x^2 - 9}/(9x) + C$
5.  $\pi/24 + \sqrt{3}/8 - \frac{1}{4}$
9.  $\ln(\sqrt{x^2 + 16} + x) + C$
13.  $\frac{1}{6}\sec^{-1}(x/3) - \sqrt{x^2 - 9}/(2x^2) + C$
15.  $\frac{1}{16}\pi a^4$
19.  $\ln|(\sqrt{1+x^2}-1)/x| + \sqrt{1+x^2} + C$
23.  $\frac{9}{2}\sin^{-1}((x-2)/3) + \frac{1}{2}(x-2)\sqrt{5+4x-x^2} + C$
25.  $\sqrt{x^2+x+1} - \frac{1}{2}\ln(\sqrt{x^2+x+1}+x+\frac{1}{2}) + C$
27.  $\frac{1}{2}(x+1)\sqrt{x^2+2x} - \frac{1}{2}\ln|x+1+\sqrt{x^2+2x}| + C$
29.  $\frac{1}{4}\sin^{-1}(x^2) + \frac{1}{4}x^2\sqrt{1-x^4} + C$
33.  $\frac{1}{6}(\sqrt{48} - \sec^{-1} 7)$
41.  $r\sqrt{R^2 - r^2} + \pi r^2/2 - R^2 \arcsin(r/R)$
3.  $\frac{1}{3}(x^2 - 18)\sqrt{x^2 + 9} + C$
7.  $-\sqrt{25 - x^2}/(25x) + C$
11.  $\frac{1}{4}\sin^{-1}(2x) + \frac{1}{2}x\sqrt{1-4x^2} + C$
17.  $\sqrt{x^2 - 7} + C$
21.  $\frac{9}{500}\pi$
25.  $22,098x + 48,935$
43.  $2\pi^2 Rr^2$

## EXERCISES 7.4 • PAGE 481

1. (a)  $\frac{A}{x+3} + \frac{B}{3x+1}$  (b)  $\frac{A}{x} + \frac{B}{x+1} + \frac{C}{(x+1)^2}$
3. (a)  $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{Dx+E}{x^2+4}$  (b)  $\frac{A}{x+3} + \frac{B}{(x+3)^2} + \frac{C}{x-3} + \frac{D}{(x-3)^2}$
5. (a)  $1 + \frac{A}{x-1} + \frac{B}{x+1} + \frac{Cx+D}{x^2+1}$  (b)  $\frac{At+B}{t^2+1} + \frac{Ct+D}{t^2+4} + \frac{Et+F}{(t^2+4)^2}$
7.  $x + 6\ln|x-6| + C$
9.  $2\ln|x+5| - \ln|x-2| + C$
13.  $a\ln|x-b| + C$
17.  $\frac{27}{5}\ln 2 - \frac{9}{5}\ln 3$  (or  $\frac{9}{5}\ln\frac{8}{3}$ )
19.  $-\frac{1}{36}\ln|x+5| + \frac{1}{6}\frac{1}{x+5} + \frac{1}{36}\ln|x-1| + C$
21.  $\frac{1}{2}x^2 - 2\ln(x^2+4) + 2\tan^{-1}(x/2) + C$
23.  $2\ln|x| + (1/x) + 3\ln|x+2| + C$
25.  $\ln|x-1| - \frac{1}{2}\ln(x^2+9) - \frac{1}{3}\tan^{-1}(x/3) + C$
27.  $\frac{1}{2}\ln(x^2+1) + (1/\sqrt{2})\tan^{-1}(x/\sqrt{2}) + C$
29.  $\frac{1}{2}\ln(x^2+2x+5) + \frac{3}{2}\tan^{-1}\left(\frac{x+1}{2}\right) + C$
31.  $\frac{1}{3}\ln|x-1| - \frac{1}{6}\ln(x^2+x+1) - \frac{1}{\sqrt{3}}\tan^{-1}\frac{2x+1}{\sqrt{3}} + C$
33.  $\frac{1}{4}\ln\frac{8}{3}$
35.  $\frac{1}{16}\ln|x| - \frac{1}{32}\ln(x^2+4) + \frac{1}{8(x^2+4)} + C$

37.  $\frac{7}{8}\sqrt{2}\tan^{-1}\left(\frac{x-2}{\sqrt{2}}\right) + \frac{3x-8}{4(x^2-4x+6)} + C$

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

41.  $2 + \ln\frac{25}{9}$  43.  $\frac{3}{10}(x^2+1)^{5/3} - \frac{3}{4}(x^2+1)^{2/3} + C$

45.  $2\sqrt{x} + 3\sqrt[3]{x} + 6\sqrt[5]{x} + 6\ln|\sqrt[5]{x}-1| + C$

47.  $\ln\left[\frac{(e^x+2)^2}{e^x+1}\right] + C$

49.  $\ln|\tan t+1| - \ln|\tan t+2| + C$

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

53.  $-\frac{1}{2}\ln 3 \approx -0.55$

55.  $\frac{1}{2}\ln\left|\frac{x-2}{x}\right| + C$  59.  $\frac{1}{5}\ln\left|\frac{2\tan(x/2)-1}{\tan(x/2)+2}\right| + C$

61.  $4\ln\frac{2}{3} + 2$  63.  $-1 + \frac{11}{3}\ln 2$

65.  $t = -\ln P - \frac{1}{9}\ln(0.9P + 900) + C$ , where  $C \approx 10.23$

67. (a)  $\frac{24,110}{4879}\frac{1}{5x+2} - \frac{668}{323}\frac{1}{2x+1} - \frac{9438}{80,155}\frac{1}{3x-7} + \frac{1}{260,015}\frac{22,098x+48,935}{x^2+x+5}$

(b)  $\frac{4822}{4879}\ln|5x+2| - \frac{334}{323}\ln|2x+1| - \frac{3146}{80,155}\ln|3x-7| + \frac{11,049}{260,015}\ln(x^2+x+5) + \frac{75,772}{260,015\sqrt{19}}\tan^{-1}\frac{2x+1}{\sqrt{19}} + C$

The CAS omits the absolute value signs and the constant of integration.

## EXERCISES 7.5 • PAGE 488

1.  $\sin x + \frac{1}{3}\sin^3 x + C$
3.  $\sin x + \ln|\csc x - \cot x| + C$
5.  $4 - \ln 9$
9.  $\frac{243}{5}\ln 3 - \frac{242}{25}$
13.  $\frac{1}{8}\cos^8\theta - \frac{1}{6}\cos^6\theta + C$  (or  $\frac{1}{4}\sin^4\theta - \frac{1}{3}\sin^6\theta + \frac{1}{8}\sin^8\theta + C$ )
15.  $x/\sqrt{1-x^2} + C$
17.  $\frac{1}{4}x^2 - \frac{1}{2}x\sin x \cos x + \frac{1}{4}\sin^2 x + C$   
(or  $\frac{1}{4}x^2 - \frac{1}{4}x\sin 2x - \frac{1}{8}\cos 2x + C$ )
19.  $e^{e^x} + C$
23.  $\frac{4097}{45}$  25.  $3x + \frac{23}{3}\ln|x-4| - \frac{5}{3}\ln|x+2| + C$
27.  $x - \ln(1+e^x) + C$
31.  $\sin^{-1}x - \sqrt{1-x^2} + C$
33.  $2\sin^{-1}\left(\frac{x+1}{2}\right) + \frac{x+1}{2}\sqrt{3-2x-x^2} + C$
35. 0
37.  $\pi/8 - \frac{1}{4}$
39.  $\ln|\sec\theta - 1| - \ln|\sec\theta| + C$
41.  $\theta \tan\theta - \frac{1}{2}\theta^2 - \ln|\sec\theta| + C$
45.  $-\frac{1}{3}(x^3+1)e^{-x^3} + C$
47.  $\ln|x-1| - 3(x-1)^{-1} - \frac{3}{2}(x-1)^{-2} - \frac{1}{3}(x-1)^{-3} + C$
49.  $\ln\left|\frac{\sqrt{4x+1}-1}{\sqrt{4x+1}+1}\right| + C$
51.  $-\ln\left|\frac{\sqrt{4x^2+1}+1}{2x}\right| + C$
53.  $\frac{1}{m}x^2 \cosh(mx) - \frac{2}{m^2}x \sinh(mx) + \frac{2}{m^3} \cosh(mx) + C$

55.  $2 \ln \sqrt{x} - 2 \ln(1 + \sqrt{x}) + C$

57.  $\frac{3}{7}(x+c)^{7/3} - \frac{3}{4}c(x+c)^{4/3} + C$

59.  $\sin(\sin x) - \frac{1}{3}\sin^3(\sin x) + C$  61.  $2(x - 2\sqrt{x} + 2)e^{\sqrt{x}} + C$

63.  $-\tan^{-1}(\cos^2 x) + C$  65.  $\frac{2}{3}[(x+1)^{3/2} - x^{3/2}] + C$

67.  $\sqrt{2} - 2/\sqrt{3} + \ln(2 + \sqrt{3}) - \ln(1 + \sqrt{2})$

69.  $e^x - \ln(1 + e^x) + C$

71.  $-\sqrt{1-x^2} + \frac{1}{2}(\arcsin x)^2 + C$

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

75.  $2(x-2)\sqrt{1+e^x} + 2\ln\frac{\sqrt{1+e^x}+1}{\sqrt{1+e^x}-1} + C$

77.  $\frac{2}{3}\tan^{-1}(x^{3/2}) + C$

79.  $\frac{1}{3}x\sin^3 x + \frac{1}{3}\cos x - \frac{1}{9}\cos^3 x + C$  81.  $xe^{x^2} + C$

## EXERCISES 7.6 ■ PAGE 493

1.  $(-1/x)\sqrt{7-2x^2} - \sqrt{2}\sin^{-1}(\sqrt{2}x/\sqrt{7}) + C$

3.  $\frac{1}{2\pi}\sec(\pi x)\tan(\pi x) + \frac{1}{2\pi}\ln|\sec(\pi x) + \tan(\pi x)| + C$

5.  $\pi/4$  7.  $\frac{1}{2\pi}\tan^2(\pi x) + \frac{1}{\pi}\ln|\cos(\pi x)| + C$

9.  $-\sqrt{4x^2+9}/(9x) + C$  11.  $e - 2$

13.  $-\frac{1}{2}\tan^2(1/z) - \ln|\cos(1/z)| + C$

15.  $\frac{1}{2}(e^{2x}+1)\arctan(e^x) - \frac{1}{2}e^x + C$

17.  $\frac{2y-1}{8}\sqrt{6+4y-4y^2} + \frac{7}{8}\sin^{-1}\left(\frac{2y-1}{\sqrt{7}}\right)$   
 $- \frac{1}{12}(6+4y-4y^2)^{3/2} + C$

19.  $\frac{1}{9}\sin^3 x [3\ln(\sin x) - 1] + C$

21.  $\frac{1}{2\sqrt{3}}\ln\left|\frac{e^x+\sqrt{3}}{e^x-\sqrt{3}}\right| + C$

23.  $\frac{1}{4}\tan x\sec^3 x + \frac{3}{8}\tan x\sec x + \frac{3}{8}\ln|\sec x + \tan x| + C$

25.  $\frac{1}{2}(\ln x)\sqrt{4+(\ln x)^2} + 2\ln[\ln x + \sqrt{4+(\ln x)^2}] + C$

27.  $\sqrt{e^{2x}-1} - \cos^{-1}(e^{-x}) + C$

29.  $\frac{1}{5}\ln|x^5+\sqrt{x^{10}-2}| + C$  31.  $2\pi^2$

35.  $\frac{1}{3}\tan x\sec^2 x + \frac{2}{3}\tan x + C$

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

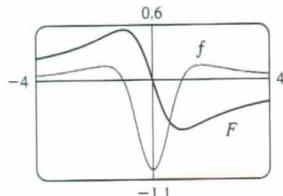
39.  $\frac{1}{10}(1+2x)^{5/2} - \frac{1}{6}(1+2x)^{3/2} + C$

41.  $-\ln|\cos x| - \frac{1}{2}\tan^2 x + \frac{1}{4}\tan^4 x + C$

43. (a)  $-\ln\left|\frac{1+\sqrt{1-x^2}}{x}\right| + C;$

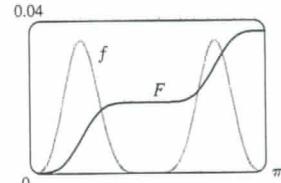
both have domain  $(-1, 0) \cup (0, 1)$ 

45.  $F(x) = \frac{1}{2}\ln(x^2-x+1) - \frac{1}{2}\ln(x^2+x+1);$

max. at  $-1$ , min. at  $1$ ; IP at  $-1.7, 0$ , and  $1.7$ 

47.  $F(x) = -\frac{1}{10}\sin^3 x \cos^7 x - \frac{3}{80}\sin x \cos^7 x + \frac{1}{160}\sin x \cos^5 x$

$+ \frac{1}{128}\sin x \cos^3 x + \frac{3}{256}\sin x \cos x + \frac{3}{256}x;$

max. at  $\pi$ , min. at  $0$ ; IP at  $0.7, \pi/2$ , and  $2.5$ 

## EXERCISES 7.7 ■ PAGE 505

1. (a)  $L_2 = 6, R_2 = 12, M_2 \approx 9.6$

(b)  $L_2$  is an underestimate,  $R_2$  and  $M_2$  are overestimates.

(c)  $T_2 = 9 < I < M_n < R_n < R_2$

3. (a)  $T_4 \approx 0.895759$  (underestimate)

(b)  $M_4 \approx 0.908907$  (overestimate)

$T_4 < I < M_4$

5. (a)  $5.932957, E_M \approx -0.063353$

(b)  $5.869247, E_S \approx 0.000357$

7. (a)  $2.413790$  (b)  $2.411453$  (c)  $2.412232$

9. (a)  $0.146879$  (b)  $0.147391$  (c)  $0.147219$

11. (a)  $0.451948$  (b)  $0.451991$  (c)  $0.451976$

13. (a)  $4.513618$  (b)  $4.748256$  (c)  $4.675111$

15. (a)  $-0.495333$  (b)  $-0.543321$  (c)  $-0.526123$

17. (a)  $1.064275$  (b)  $1.067416$  (c)  $1.074915$

19. (a)  $T_8 \approx 0.902333, M_8 \approx 0.905620$

(b)  $|E_T| \leq 0.0078, |E_M| \leq 0.0039$

(c)  $n = 71$  for  $T_n, n = 50$  for  $M_n$

21. (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)  $n = 509$  for  $T_n, n = 360$  for  $M_n, n = 22$  for  $S_n$

23. (a)  $2.8$  (b)  $7.954926518$  (c)  $0.2894$

(d)  $7.954926521$  (e) The actual error is much smaller.

(f)  $10.9$  (g)  $7.953789422$  (h)  $0.0593$

(i) The actual error is smaller. (j)  $n \geq 50$ 

<b>25.</b>	<b><math>n</math></b>	<b><math>L_n</math></b>	<b><math>R_n</math></b>	<b><math>T_n</math></b>	<b><math>M_n</math></b>
	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

<b><math>n</math></b>	<b><math>E_L</math></b>	<b><math>E_R</math></b>	<b><math>E_T</math></b>	<b><math>E_M</math></b>
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

Observations are the same as after Example 1.