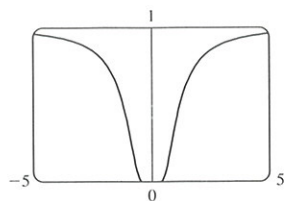


39.



$(\pm 0,82, 0,22); (\pm \sqrt{2/3}, e^{-3/2})$

41.  $-2,96, -0,18, 3,01; -1,57, 1,57; -2,16, -0,75, 0,46, 2,21$

43. Para  $C > -1$ ,  $f$  é periódica com período  $2\pi$  e tem máximos locais em  $2n\pi + \pi/2$ ,  $n$  um inteiro. Para  $C \leq -1$ ,  $f$  não tem gráfico. Para  $-1 < C \leq 1$ ,  $f$  tem assíntotas verticais. Para  $C > 1$ ,  $f$  é contínua em  $\mathbb{R}$ . À medida que  $C$  aumenta,  $f$  se move para cima e sua oscilação se torna menos pronunciada.

49. (a) 0 (b) CC em  $\mathbb{R}$  53.  $3\sqrt{3}r^2$

55.  $4\sqrt{3}$  cm de  $D$  57.  $L = C$  59. \$11,50

61. 1,297383 63. 1,16718557

65.  $f(x) = \sin x - \sin^{-1}x + C$

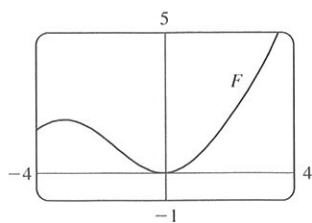
67.  $f(x) = \frac{2}{5}x^{5/2} + \frac{3}{5}x^{5/3} + C$

69.  $f(t) = t^2 + 3 \cos t + 2$

71.  $f(x) = \frac{1}{2}x^2 - x^3 + 4x^4 + 2x + 1$

73.  $s(t) = t^2 - \operatorname{tg}^{-1}t + 1$

75. (b)  $0,1e^x - \cos x + 0,9$  (c)



77. Não

79. (b) Cerca de 25,44 cm por 5,96 cm (c)  $2\sqrt{300}$  cm,  $2\sqrt{600}$  cm

**PROBLEMAS QUENTES ■ PÁGINA 330**

5. 24 7.  $(-2, 4), (2, -4)$  11.  $-3,5 < a < 2,5$

13.  $(m/2, m^2/4)$  15.  $a \leq e^{1/e}$

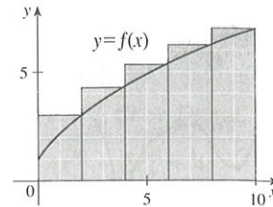
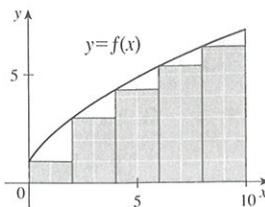
19. (a)  $T_1 = D/c_1, T_2 = (2h \sec \theta)/c_1 + (D - 2h \operatorname{tg} \theta)/c_2,$   
 $T_3 = \sqrt{4h^2 + D^2}/c_1$   
 (c)  $c_1 \approx 3,85$  km/s,  $c_2 \approx 7,66$  km/s,  $h \approx 0,42$  km

23.  $3/(\sqrt[3]{2} - 1) \approx 11\frac{1}{2}$  h

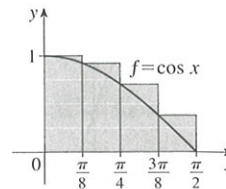
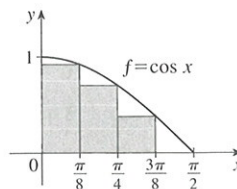
**CAPÍTULO 5**

**EXERCÍCIOS 5.1 ■ PÁGINA 343**

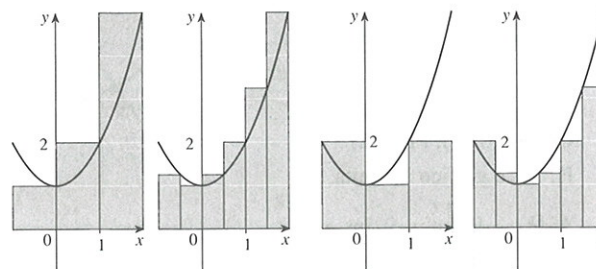
1. (a) 40, 52 (b) 43,2, 49,2



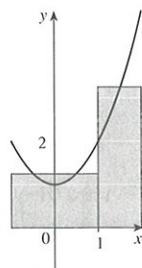
3. (a) 0,7908 subestimado (b) 1,1835, superestimado



5. (a) 8, 6,875 (b) 5, 5,5375



(c) 5,75, 5,9375



(d)  $M_6$

7. 0,2533, 0,2170, 0,2101, 0,2050; 0,2

9. (a) À esquerda: 0,8100, 0,7937, 0,7904; à direita: 0,7600, 0,7770, 0,7804

11. 10,55 m, 13,65 m 13. 63,2 L, 70 L 15. 39 m

17.  $\lim_{n \rightarrow \infty} \sum_{i=1}^n \sqrt[4]{1 + 15i/n} \cdot (15/n)$  19.  $\lim_{n \rightarrow \infty} \sum_{i=1}^n \left( \frac{i\pi}{2n} \cos \frac{i\pi}{2n} \right) \frac{\pi}{2n}$

21. A região sob o gráfico de  $y = \operatorname{tg} x$  de 0 a  $\pi/4$

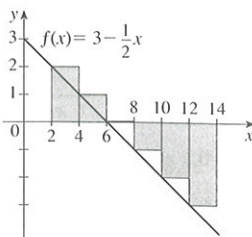
23. (a)  $\lim_{n \rightarrow \infty} \frac{64}{n^6} \sum_{i=1}^n i^5$  (b)  $\frac{n^2(n+1)^2(2n^2+2n-1)}{12}$  (c)  $\frac{32}{3}$

25.  $\operatorname{sen} b, 1$

**EXERCÍCIOS 5.2 ■ PÁGINA 354**

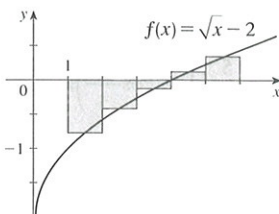
1. -6

A soma de Riemann representa a soma das áreas dos dois retângulos acima do eixo  $x$  menos a soma das áreas dos três retângulos abaixo do eixo  $x$ ; isto é, a área resultante dos retângulos com relação ao eixo  $x$ .



3. -0,856759

A soma de Riemann representa a soma das áreas dos dois retângulos acima do eixo  $x$  menos a soma das áreas dos três retângulos abaixo do eixo  $x$ .



5. (a)4 (b)6 (c)10 7. -475, -85 9. 124,1644

11. 0,3084 13. 0,30843908, 0,30981629, 0,31015563

$n$	$R_n$
5	1,933766
10	1,983524
50	1,999342
100	1,999836

Os valores de  $R_n$  parecem se aproximar de 2.

17.  $\int_2^6 x \ln(1+x^2) dx$  19.  $\int_1^8 \sqrt{2x+x^2} dx$  21. 42

23.  $\frac{4}{3}$  25. 3,75 29.  $\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{2+4i/n}{1+(2+4i/n)^5} \cdot \frac{4}{n}$

31.  $\lim_{n \rightarrow \infty} \sum_{i=1}^n \left( \sin \frac{5\pi i}{n} \right) \frac{\pi}{n} = \frac{2}{5}$

33. (a) 4 (b) 10 (c) -3 (d) 2 35. 10

37.  $3 + \frac{9}{4} \pi$  39. 2,5 41. 0 43. 3 45.  $e^5 - e^3$

47.  $\int_{-1}^5 f(x) dx$  49. 122

51.  $2m \leq \int_0^2 f(x) dx < 2M$  pela Propriedade 8 da Comparação

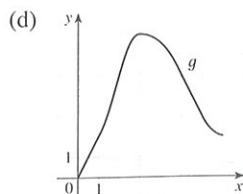
55.  $3 \leq \int_1^4 \sqrt{x} dx \leq 6$  57.  $\frac{\pi}{12} \leq \int_{\pi/4}^{\pi/3} \operatorname{tg} x dx \leq \frac{\pi}{12} \sqrt{3}$

59.  $0 \leq \int_0^2 x e^{-x} dx \leq 2/e$  69.  $\int_0^1 x^4 dx$  71.  $\frac{1}{2}$

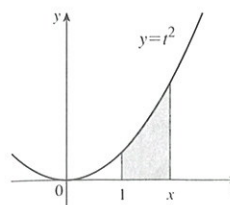
**EXERCÍCIOS 5.3 ■ PÁGINA 364**

1. Um processo desfaz o que o outro faz. Veja o Teorema Fundamental do Cálculo, na página 363.

3. (a) 0, 2, 5, 7, 3  
(b) (0, 3)  
(c)  $x = 3$



5. (a), (b)  $x^2$



7.  $g'(x) = 1/(x^3 + 1)$

9.  $g'(y) = y^2 \operatorname{sen} y$  11.  $F'(x) = -\sqrt{1 + \sec x}$

13.  $h'(x) = -\frac{\operatorname{arctg}(1/x)}{x^2}$  15.  $y' = \sqrt{\operatorname{tg} x + \sqrt{\operatorname{tg} x \sec^2 x}}$

17.  $y' = \frac{3(1-3x)^3}{1+(1-3x)^2}$  19.  $\frac{3}{4}$  21. 63

23.  $\frac{16}{3}$  25.  $\frac{7}{8}$  27.  $\frac{156}{7}$  29.  $\frac{40}{3}$  31. 1 33.  $\frac{49}{3}$

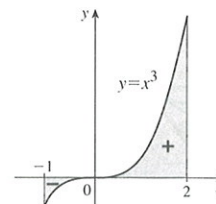
35.  $\ln 3$  37.  $\pi$  39.  $e^2 - 1$  41. 0

43. A função  $f(x) = x^{-4}$  não é contínua no intervalo  $[-2, 1]$ , de modo que o TFC2 não pode ser aplicado.

45. A função  $f(\theta) = \sec \theta \operatorname{tg} \theta$  não é contínua no intervalo  $[\pi/3, \pi]$ , de modo que o TFC2 não pode ser aplicado.

47.  $\frac{243}{4}$  49. 2

51. 3,75

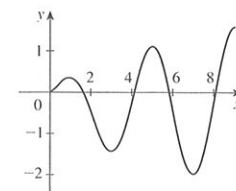


53.  $g'(x) = \frac{-2(4x^2 - 1)}{4x^2 + 1} + \frac{3(9x^2 - 1)}{9x^2 + 1}$

55.  $y' = 3x^{7/2} \operatorname{sen}(x^3) - \frac{\operatorname{sen} \sqrt{x}}{2\sqrt{x}}$  57.  $\sqrt{257}$  59. 29

61. (a)  $-2\sqrt{n}, \sqrt{4n-2}, n$  um inteiro  $> 0$   
(b)  $(0, 1), (-\sqrt{4n-1}, -\sqrt{4n-3}), e(\sqrt{4n-1}, \sqrt{4n+1})$ ,  
 $n$  um inteiro  $> 0$  (c) 0,74

63. (a) Máx. loc. em 1 e 5;  
mín. loc. em 3 e 7  
(b)  $x = 9$   
(c)  $(\frac{1}{2}, 2), (4, 6), (8, 9)$   
(d) Ver o gráfico à direita.



65.  $\frac{1}{4}$  73.  $f(x) = x^{3/2}, a = 9$

75. (b) Gasto médio em  $[0, t]$ ; minimiza o gasto médio

**EXERCÍCIOS 5.4 ■ PÁGINA 372**

5.  $\frac{1}{3}x^3 - (1/x) + C$  7.  $\frac{1}{4}x^4 + 3x^2 + x + C$

9.  $2t - t^2 + \frac{1}{3}t^3 - \frac{1}{4}t^4 + C$

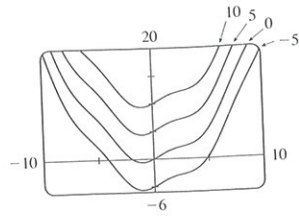
11.  $\frac{1}{3}x^3 - 4\sqrt{x} + C$

13.  $-\cos x + \cosh x + C$

15.  $\frac{1}{2}\theta^2 + \operatorname{cosec} \theta + C$

17.  $\operatorname{tg} \alpha + C$

19.  $\operatorname{sen} x + \frac{1}{4}x^2 + C$



21. 18      23.  $-2 + 1/e$       25. 52

27.  $\frac{256}{15}$       29.  $-\frac{63}{4}$       31.  $\frac{55}{63}$       33.  $2\sqrt{5}$       35. 8

37.  $1 + \pi/4$       39.  $\frac{256}{5}$       41.  $\pi/6$       43.  $-3,5$

45. 0, 1,32; 0,84      47.  $\frac{4}{3}$

49. O aumento no peso da criança (em quilogramas) entre as idades de 5 e 10 anos

51. Número de litros de petróleo que vazou nas primeiras 2 horas

53. Aumento na receita quando a produção aumenta de 1 000 para 5 000 unidades

55. Newton-metros (ou joules)      57. (a)  $-\frac{3}{2}m$       (b)  $\frac{41}{6}m$

59. (a)  $v(t) = \frac{1}{2}t^2 + 4t + 5$  m/s      (b)  $416\frac{2}{3}m$

61.  $46\frac{2}{3}kg$       63. 2,2 km      65. \$58 000

67. (b) No máximo 40%;  $\frac{5}{36}$

**EXERCÍCIOS 5.5 ■ PÁGINA 381**

1.  $\frac{1}{3}\operatorname{sen} 3x + C$       3.  $\frac{2}{9}(x^3 + 1)^{3/2} + C$       5.  $-1/(1 + 2x)^2 + C$

7.  $-\frac{1}{2}\cos(x^2) + C$       9.  $\frac{1}{63}(3x - 2)^{21} + C$

11.  $\frac{1}{3}(2x + x^2)^{3/2} + C$       13.  $-\frac{1}{3}\ln|5 - 3x| + C$

15.  $-(1/\pi)\cos \pi t + C$       17.  $\frac{2}{3}\sqrt{3ax + bx^3} + C$

19.  $\frac{1}{3}(\ln x)^3 + C$       21.  $2 \operatorname{sen} \sqrt{t} + C$

23.  $\frac{1}{7}\operatorname{sen}^7 \theta + C$       25.  $\frac{2}{3}(1 + e^y)^{3/2} + C$

27.  $\frac{1}{2}(1 + z^3)^{2/3} + C$       29.  $e^{\operatorname{tg} x} + C$

31.  $-1/(\operatorname{sen} x) + C$       33.  $-\frac{2}{3}(\cotg x)^{3/2} + C$

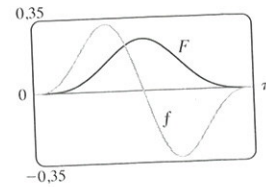
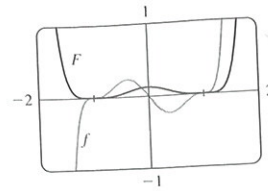
35.  $-\ln(1 + \cos^2 x) + C$       37.  $\ln|\operatorname{sen} x| + C$

39.  $\frac{1}{3}\sec^3 x + C$       41.  $\ln|\operatorname{sen}^{-1} x| + C$

43.  $\operatorname{tg}^{-1} x + \frac{1}{2}\ln(1 + x^2) + C$

45.  $\frac{4}{7}(x + 2)^{7/4} - \frac{8}{3}(x + 2)^{3/4} + C$

47.  $\frac{1}{8}(x^2 - 1)^4 + C$       49.  $\frac{1}{4}\operatorname{sen}^4 x + C$



51. 0      53.  $\frac{182}{9}$       55. 4

57. 0      59.  $e - \sqrt{e}$       61. 1

65.  $\frac{16}{15}$       67. 2      69.  $\ln(e + 1)$       71.  $\sqrt{3} - \frac{1}{3}$

73.  $6\pi$       75. Todas as três áreas são iguais.      77.  $\approx 4\,512\,L$

79.  $\frac{5}{4\pi}(1 - \cos \frac{2\pi t}{5})L$       81. 5      87.  $\pi^2/4$

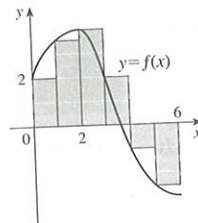
**CAPÍTULO 5 REVISÃO ■ PÁGINA 384**

Teste Verdadeiro-Falso

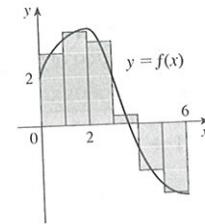
1. Verdadeiro      3. Verdadeiro      5. Falso      7. Verdadeiro  
9. Verdadeiro      11. Falso      13. Falso      15. Falso

Exercícios

1. (a) 8



(b) 5,7



3.  $\frac{1}{2} + \pi/4$       5. 3

7.  $f \in c, f' \in b, \int_0^x f(t) dt \in a$

9. 37      11.  $\frac{9}{10}$       13. -76      15.  $\frac{21}{4}$       17. Não existe

19.  $\frac{1}{3}\operatorname{sen} 1$       21. 0      23.  $-(1/x) - 2 \ln|x| + x + C$

25.  $\sqrt{x^2 + 4x} + C$       27.  $[1/(2\pi)] \operatorname{sen}^2 \pi t + C$

29.  $2e^{\sqrt{x}} + C$       31.  $\frac{1}{2}[\ln(\cos x)]^2 + C$

33.  $\frac{1}{4}\ln(1 + x^4) + C$       35.  $\ln|1 + \sec \theta| + C$       37.  $\frac{23}{3}$

39.  $2\sqrt{1 + \operatorname{sen} x} + C$       41.  $\frac{64}{5}$       43.  $F'(x) = x^2/(1 + x^3)$

45.  $g'(x) = 4x^3 \cos(x^8)$       47.  $y' = (2e^x - e^{\sqrt{x}})/(2x)$

49.  $4 \leq \int_1^3 \sqrt{x^2 + 3} dx \leq 4\sqrt{3}$       55. 0,280981

57. Número de barris de petróleo consumidos de 1 de janeiro de 2000 até 1 de janeiro de 2008

59. 72 400      61. 3      63.  $c \approx 1,62$

65.  $f(x) = e^{2x}(1 + 2x)/(1 - e^{-x})$       71.  $\frac{2}{3}$

**PROBLEMAS QUENTES ■ PÁGINA 388**

1.  $\pi/2$       3.  $f(x) = \frac{1}{2}x$       5. -1      7.  $e^{-2}$       9.  $[-1, 2]$

11. (a)  $\frac{1}{2}(n - 1)n$       (b)  $\frac{1}{2}|b|(2b - |b| - 1) - \frac{1}{2}|a|(2a - |a| - 1)$

17.  $2(\sqrt{2} - 1)$

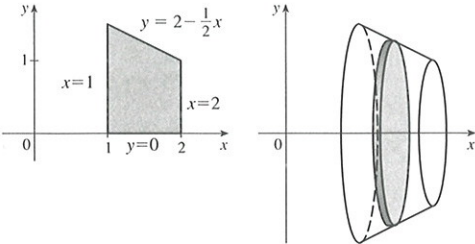
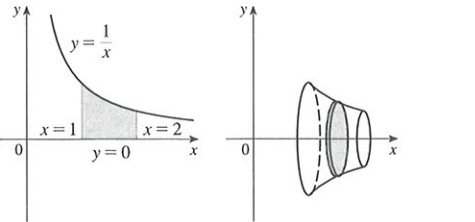
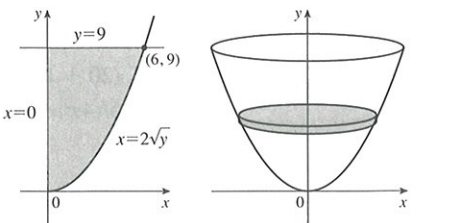
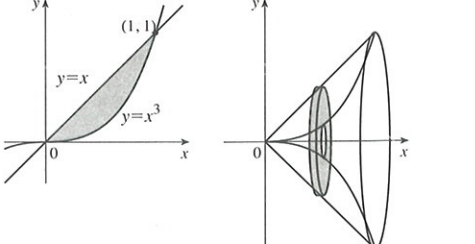
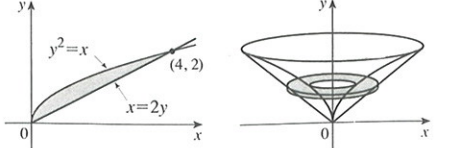


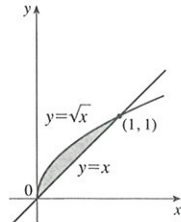
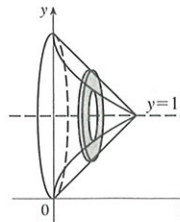
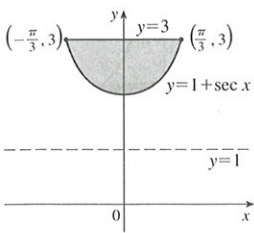
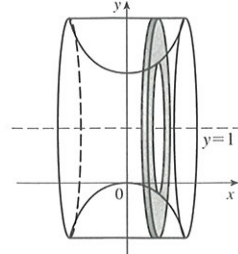
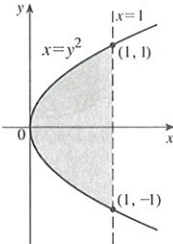
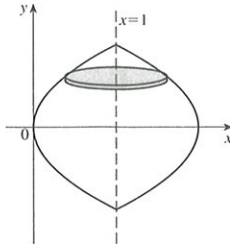
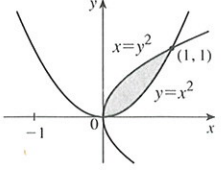
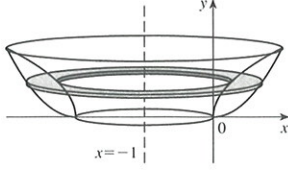
CAPÍTULO 6

EXERCÍCIOS 6.1 ■ PÁGINA 395

1.  $\frac{32}{3}$     3.  $e - (1/e) + \frac{10}{3}$     5. 19,5    7.  $\frac{1}{6}$     9.  $\ln 2 - \frac{1}{2}$   
 11.  $\frac{1}{3}$     13. 72    15.  $2 - 2 \ln 2$     17.  $\frac{59}{12}$     19.  $\frac{32}{3}$   
 21.  $\frac{8}{3}$     23.  $\frac{1}{2}$     25.  $\pi - \frac{2}{3}$     27.  $\ln 2$     29. 6,5  
 31.  $\frac{3}{2}\sqrt{3} - 1$     33. 0,6407    35. 0, 0,90; 0,04    37. 8,38  
 39.  $12\sqrt{6} - 9$     41. 36 m    43. 4 232 cm<sup>2</sup>  
 45. (a) Carro A    (b) A distância que A está à frente de B depois de 1 minuto  
       (c) Carro A    (d)  $t \approx 2,2$  min  
 47.  $\frac{24}{5}\sqrt{3}$     49.  $4^{2/3}$     51.  $\pm 6$   
 53.  $0 < m < 1; m - \ln m - 1$

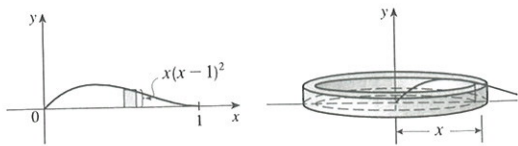
EXERCÍCIOS 6.2 ■ PÁGINA 405

1.  $19\pi/12$  
3.  $\pi/2$  
5.  $162\pi$  
7.  $4\pi/21$  
9.  $64\pi/15$  

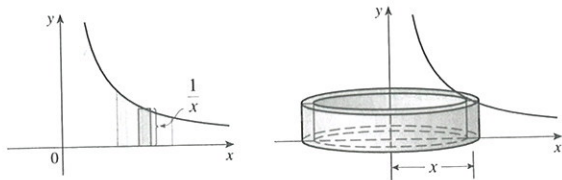
11.  $\pi/6$   
13.  $2\pi(\frac{1}{3} - \sqrt{3})$   
15.  $16\pi/15$   
17.  $29\pi/30$   
19.  $\pi/7$     21.  $\pi/10$     23.  $\pi/2$     25.  $7\pi/15$   
 27.  $5\pi/14$     29.  $13\pi/30$     31.  $\pi \int_0^{\pi/4} (1 - \tan^3 x)^2 dx$   
 33.  $\pi \int_0^{\pi} [1^2 - (1 - \sin x)^2] dx$   
 35.  $\pi \int_{-2\sqrt{2}}^{2\sqrt{2}} [5^2 - (\sqrt{1+y^2} + 2)^2] dy$   
 37. -1,288, 0,884; 23,780    39.  $\frac{11}{8}\pi^2$   
 41. Sólido obtido pela rotação da região  $0 \leq y \leq \cos x$ ,  $0 \leq x \leq \pi/2$  em torno do eixo  $x$   
 43. Sólido obtido pela rotação da região acima do eixo  $x$  limitada por  $x = y^2$  e  $x = y^4$  em torno do eixo  $y$   
 45. 1 110 cm<sup>3</sup>    47. (a) 196    (b) 838    49.  $\frac{1}{3}\pi r^2 h$   
 51.  $\pi h^2(r - \frac{1}{3}h)$     53.  $\frac{2}{3}b^2 h$     55. 10 cm<sup>3</sup>    57. 24  
 59.  $\frac{1}{3}$     61.  $\frac{8}{15}$   
 63. (a)  $8\pi R \int_0^r \sqrt{r^2 - y^2} dy$     (b)  $2\pi^2 r^2 R$   
 65.  $\pi r^2 h$     67.  $\frac{5}{12}\pi r^3$     69.  $8 \int_0^r \sqrt{R^2 - y^2} \sqrt{r^2 - y^2} dy$

**EXERCÍCIOS 6.3 ■ PÁGINA 410**

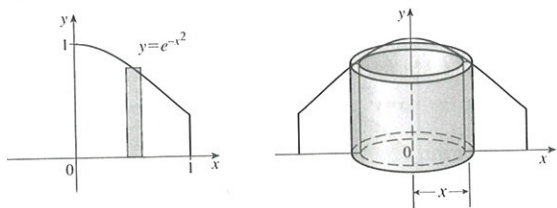
1. Circunferência =  $2\pi x$ , altura =  $x(x-1)^2$ ;  $\pi/15$



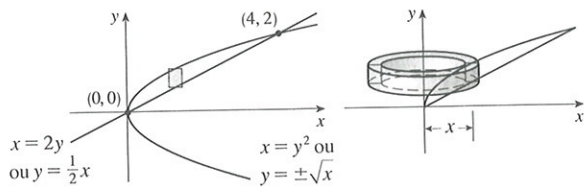
3.  $2\pi$



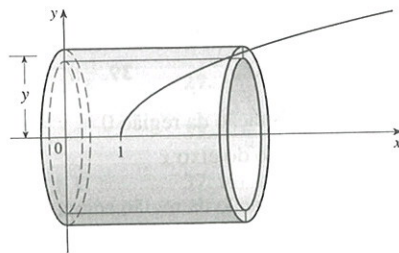
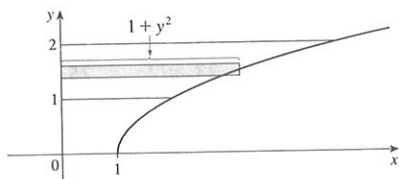
5.  $\pi(1 - 1/e)$



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



9.  $21\pi/2$



11.  $768\pi/7$     13.  $16\pi/3$     15.  $17\pi/6$     17.  $8\pi/3$

19.  $5\pi/14$     21.  $\int_1^2 2\pi x \ln x \, dx$

23.  $\int_0^1 2\pi(x+1)[\sin(\pi x/2) - x^4] \, dx$

25.  $\int_0^\pi 2\pi(4-y)\sqrt{\sin y} \, dy$     27. 3,68

29. Sólido obtido pela rotação da região  $0 \leq y \leq x^4$ ,  $0 \leq x \leq 3$  em torno do eixo y

31. Sólido obtido pela rotação da região delimitada por (i)  $x = 1 - y^2$ ,  $x = 0$ , and  $y = 0$ , ou (ii)  $x = y^2$ ,  $x = 1$ , e  $y = 0$  em torno da reta  $y = 3$

33. 0,13    35.  $\frac{1}{32}\pi^3$     37.  $8\pi$     39.  $2\pi(12 - 4 \ln 4)$

41.  $\frac{4}{3}\pi$     43.  $\frac{4}{3}\pi r^3$     45.  $\frac{1}{3}\pi r^2 h$

**EXERCÍCIOS 6.4 ■ PÁGINA 415**

1. 588 J    3. 9 J    5. 180 J    7.  $\frac{15}{4}$  pés-lb

9. (a)  $\frac{25}{24} \approx 1,04$  J    (b) 10,8 cm    11.  $W_2 = 3W_1$

13. (a) 625 pés-lb    (b)  $\frac{1875}{4}$  pés-lb    15. 650 000 pés-lb

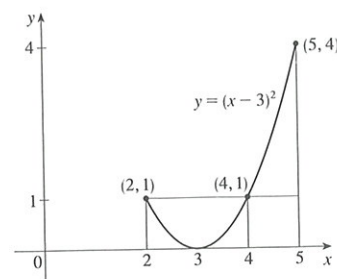
17. 3 857 J    19. 2 450 J    21.  $\approx 1,06 \times 10^6$  J

23.  $\approx 1,04 \times 10^5$  pés-lb    25. 2,0 m    29.  $Gm_1 m_2 \left( \frac{1}{a} - \frac{1}{b} \right)$

**EXERCÍCIOS 6.5 ■ PÁGINA 419**

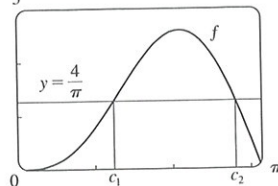
1.  $\frac{8}{3}$     3.  $\frac{45}{28}$     5.  $\frac{1}{10}(1 - e^{-25})$     7.  $2/(5\pi)$

9. (a) 1    (b) 2,4    (c)



11. (a)  $4/\pi$     (b)  $\approx 1,24, 2,81$

(c) 3



15.  $38\frac{1}{3}$

17.  $(20 + 12/\pi)^\circ\text{C} \approx 24^\circ\text{C}$

19. 6 kg/m

21.  $5/(4\pi) \approx 0,4$  L

**CAPÍTULO 6 REVISÃO ■ PÁGINA 421**

Exercícios

1.  $\frac{8}{3}$     3.  $\frac{7}{12}$     5.  $\frac{4}{3} + 4/\pi$     7.  $64\pi/15$     9.  $1\,656\pi/5$

11.  $\frac{4}{3}\pi(2ah + h^2)^{3/2}$     13.  $\int_{-\pi/3}^{\pi/3} 2\pi(\pi/2 - x)(\cos^2 x - \frac{1}{4}) \, dx$

15. (a)  $2\pi/15$     (b)  $\pi/6$     (c)  $8\pi/15$

17. (a) 0,38    (b) 0,87

19. Sólido obtido pela rotação da região  $0 \leq y \leq \cos x$ ,  $0 \leq x \leq \pi/2$  em torno do eixo y

21. Sólido obtido pela rotação da região  $0 \leq x \leq \pi$ ,  $0 \leq y \leq 2 - \sin x$  em torno do eixo x

23. 36    25.  $\frac{125}{3}\sqrt{3} \, \text{m}^3$     27. 3,2 J

29. (a)  $8\,000\pi/3 \approx 8\,378$  pés-lb    (b) 2,1 pés    31.  $f(x)$

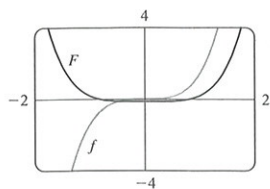
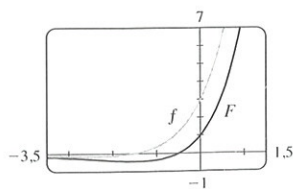
**PROBLEMAS QUENTES ■ PÁGINA 423**

1. (a)  $f(t) = 3t^2$  (b)  $f(x) = \sqrt{2x/\pi}$  3.  $\frac{32}{27}$   
 5. (b) 0,2261 (c) 0,6736 m  
 (d) (i)  $3/(119\pi) \approx 0,008$  cm/s (ii)  $1664\pi/9s \approx 9,7$  min  
 9.  $y = \frac{32}{9}x^2$   
 11. (a)  $V = \int_0^h \pi[f(y)]^2 dy$  (c)  $f(y) = \sqrt{kA/(\pi C)} y^{1/4}$   
 Vantagem: as marcas no recipiente são igualmente espaçadas.  
 13.  $b = 2a$  15.  $B = 16A$

**CAPÍTULO 7**

**EXERCÍCIOS 7.1 ■ PÁGINA 432**

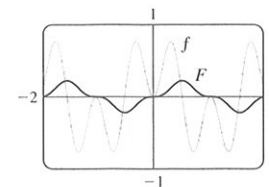
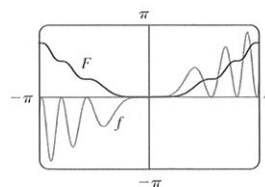
1.  $\frac{1}{3}x^3 \ln x - \frac{1}{9}x^3 + C$  3.  $\frac{1}{5}x \sin 5x + \frac{1}{25} \cos 5x + C$   
 5.  $2(r-2)e^{r/2} + C$   
 7.  $\frac{1}{3}x^2 \sin 3x + \frac{2}{9}x \cos 3x - \frac{2}{27} \sin 3x + C$   
 9.  $\frac{1}{2}(2x+1) \ln(2x+1) - x + C$   
 11.  $t \operatorname{arctg} 4t - \frac{1}{8} \ln(1+16t^2) + C$   
 13.  $\frac{1}{2}t \operatorname{tg} 2t - \frac{1}{4} \ln |\sec 2t| + C$   
 15.  $x(\ln x)^2 - 2x \ln x + 2x + C$   
 17.  $\frac{1}{13}e^{2\theta}(2 \sin 3\theta - 3 \cos 3\theta) + C$   
 19.  $\pi/3$  21.  $1 - 1/e$  23.  $\frac{1}{2} - \frac{1}{2} \ln 2$  25.  $\frac{1}{4} - \frac{3}{4}e^{-2}$   
 27.  $\frac{1}{6}(\pi + 6 - 3\sqrt{3})$  29.  $\sin x (\ln \sin x - 1) + C$   
 31.  $\frac{32}{5}(\ln 2)^2 - \frac{64}{25} \ln 2 + \frac{62}{125}$   
 33.  $2\sqrt{x} \sin \sqrt{x} + 2 \cos \sqrt{x} + C$  35.  $-\frac{1}{2} - \pi/4$   
 37.  $\frac{1}{2}(x^2 - 1) \ln(1+x) - \frac{1}{4}x^2 + \frac{1}{2}x + \frac{3}{4} + C$   
 39.  $(2x+1)e^x + C$



41.  $\frac{1}{3}x^2(1+x^2)^{3/2} - \frac{2}{15}(1+x^2)^{5/2} + C$   
 43. (b)  $-\frac{1}{4} \cos x \sin^3 x + \frac{3}{8}x - \frac{3}{16} \sin 2x + C$   
 45. (b)  $\frac{2}{3^{15}}$  51.  $x(\ln x)^3 - 3x(\ln x)^2 + 6x \ln x - 6x + C$   
 53.  $\frac{25}{4} - \frac{75}{4}e^{-2}$  55. 1,0475, 2,8731; 2,1828 57.  $4 - 8/\pi$   
 59.  $2\pi e$  61.  $\frac{9}{2} \ln 3 - \frac{13}{9}$  63.  $2 - e^{-t^2 + 2t + 2}$  m  
 65. 2

**EXERCÍCIOS 7.2 ■ PÁGINA 439**

1.  $\frac{1}{5} \cos^5 x - \frac{1}{3} \cos^3 x + C$  3.  $-\frac{11}{384}$   
 5.  $\frac{1}{3\pi} \sin^3(\pi x) - \frac{2}{5\pi} \sin^5(\pi x) + \frac{1}{7\pi} \sin^7(\pi x) + C$   
 7.  $\pi/4$  9.  $\frac{3}{8}t + \frac{1}{4} \sin 2t + \frac{1}{32} \sin 4t + C$   
 11.  $\frac{3}{2}\theta + 2 \sin \theta + \frac{1}{4} \sin 2\theta + C$   
 13.  $\pi/16$  15.  $\frac{2}{45} \sqrt{\sin \alpha} (45 - 18 \sin^2 \alpha + 15 \sin^4 \alpha) + C$   
 17.  $\frac{1}{2} \cos^2 x - \ln |\cos x| + C$  19.  $\ln |\sin x| + 2 \sin x + C$   
 21.  $\frac{1}{2} \operatorname{tg}^2 x + C$  23.  $\operatorname{tg} x - x + C$   
 25.  $\frac{1}{5} \operatorname{tg}^5 t + \frac{2}{3} \operatorname{tg}^3 t + \operatorname{tg} t + C$  27.  $\frac{117}{8}$   
 29.  $\frac{1}{3} \sec^3 x - \sec x + C$   
 31.  $\frac{1}{4} \sec^4 x - \operatorname{tg}^2 x + \ln |\sec x| + C$   
 33.  $\frac{1}{6} \operatorname{tg}^6 \theta + \frac{1}{4} \operatorname{tg}^4 \theta + C$   
 35.  $x \sec x - \ln |\sec x \operatorname{tg} x| + C$  37.  $\sqrt{3} - \frac{1}{3}\pi$   
 39.  $\frac{1}{3} \operatorname{cosec}^3 \alpha - \frac{1}{5} \operatorname{cosec}^5 \alpha + C$  41.  $\ln |\operatorname{cosec} x - \cotg x| + C$   
 43.  $-\frac{1}{6} \cos 3x - \frac{1}{26} \cos 13x + C$  45.  $\frac{1}{4} \sin 2\theta + \frac{1}{24} \sin 12\theta + C$   
 47.  $\frac{1}{2} \sin 2x + C$  49.  $\frac{1}{10} \operatorname{tg}^5(t^2) + C$   
 51.  $\frac{1}{4}x^2 - \frac{1}{4} \sin(x^2) \cos(x^2) + C$  53.  $\frac{1}{6} \sin 3x - \frac{1}{18} \sin 9x + C$



55. 0 57. 1 59. 0 61.  $\pi^2/4$  63.  $\pi(2\sqrt{2} - \frac{5}{2})$   
 65.  $s = (1 - \cos^3 \omega t)/(3\omega)$

**EXERCÍCIOS 7.3 ■ PÁGINA 445**

1.  $\sqrt{x^2 - 9}/(9x) + C$  3.  $\frac{1}{3}(x^2 - 18)\sqrt{x^2 + 9} + C$   
 5.  $\pi/24 + \sqrt{3}/8 - \frac{1}{4}$  7.  $-\sqrt{25 - x^2}/(25x) + C$   
 9.  $\ln(\sqrt{x^2 + 16} + x) + C$  11.  $\frac{1}{4} \sin^{-1}(2x) + \frac{1}{2}x \sqrt{1 - 4x^2} + C$   
 13.  $\frac{1}{6} \sec^{-1}(x/3) - \sqrt{x^2 - 9}/(2x^2) + C$   
 15.  $\frac{1}{16} \pi a^4$  17.  $\sqrt{x^2 - 7} + C$   
 19.  $\ln |(\sqrt{1+x^2} - 1)/x| + \sqrt{1+x^2} + C$  21.  $\frac{9}{500}\pi$   
 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.  $\frac{1}{6}(\sqrt{48} - \sec^{-1}7)$  37. 0,81, 2; 2,10  
 41.  $r\sqrt{R^2 - r^2} + \pi r^2/2 - R^2 \operatorname{arcsen}(r/R)$  43.  $2\pi^2 R r^2$



## EXERCÍCIOS 7.4 ■ PÁGINA 454

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)  $\frac{A}{x+4} + \frac{B}{x-1}$  (b)  $\frac{A}{x-1} + \frac{Bx+C}{x^2+x+1}$

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

9.  $2 \ln|x+5| - \ln|x-2| + C$  11.  $\frac{1}{2} \ln \frac{3}{2}$

13.  $a \ln|x-b| + C$  15.  $\frac{7}{6} + \ln \frac{2}{3}$

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.  $\frac{1}{2}x^2 - 2 \ln(x^2+4) + 2 \operatorname{tg}^{-1}(x/2) + C$

23.  $2 \ln|x| + (1/x) + 3 \ln|x+2| + C$

25.  $\ln|x-1| - \frac{1}{2} \ln(x^2+9) - \frac{1}{3} \operatorname{tg}^{-1}(x/3) + C$

27.  $\frac{1}{2} \ln(x^2+1) + (1/\sqrt{2}) \operatorname{tg}^{-1}(x/\sqrt{2}) + C$

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

31.  $\frac{1}{3} \ln|x-1| - \frac{1}{6} \ln(x^2+x+1) - \frac{1}{\sqrt{3}} \operatorname{tg}^{-1} \frac{2x+1}{\sqrt{3}} + C$

33.  $\frac{1}{3} \ln \frac{17}{2}$  35.  $(1/x) + \frac{1}{2} \ln|(x-1)/(x+1)| + C$

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

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

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

49.  $\ln|\operatorname{tg} t + 1| - \ln|\operatorname{tg} t + 2| + C$

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

53.  $-\frac{1}{2} \ln 3 \approx -0,55$

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

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)  $\frac{24}{4879} \frac{110}{5x+2} - \frac{668}{323} \frac{1}{2x+1} - \frac{9438}{80155} \frac{1}{3x-7} +$

$\frac{1}{260015} \frac{22098x + 48935}{x^2 + x + 5}$

(b)  $\frac{4822}{4879} \ln|5x+2| - \frac{334}{323} \ln|2x+1| - \frac{3146}{80155} \ln|3x-7|$

$+ \frac{11049}{260015} \ln(x^2+x+5) + \frac{75772}{260015\sqrt{19}} \operatorname{tg}^{-1} \frac{2x+1}{\sqrt{19}} + C$

O SCA omite o sinal de valor absoluto e a constante de integração.

## EXERCÍCIOS 7.5 ■ PÁGINA 461

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

3.  $\operatorname{tg}^{-1}(\sin x) + C$

5.  $4 - \ln 9$  7.  $e^{\pi/4} - e^{-\pi/4}$

9.  $\frac{243}{5} \ln 3 - \frac{242}{25}$  11.  $\frac{1}{2} \ln(x^2 - 4x + 5) + \operatorname{tg}^{-1}(x-2) + C$

13.  $\frac{1}{8} \cos^8 \theta - \frac{1}{6} \cos^6 \theta + C$  (ou  $\frac{1}{4} \sin^4 \theta - \frac{1}{3} \sin^6 \theta + \frac{1}{8} \sin^8 \theta + C$ )

15.  $x/\sqrt{1-x^2} + C$

17.  $\frac{1}{4} x^2 - \frac{1}{2} x \sin x \cos x + \frac{1}{4} \sin^2 x + C$   
(ou  $\frac{1}{4} x^2 - \frac{1}{4} x \sin 2x - \frac{1}{8} \cos 2x + C$ )

19.  $e^{e^x} + C$  21.  $(x+1) \operatorname{arctg} \sqrt{x} - \sqrt{x} + C$

23.  $\frac{4097}{45}$  25.  $3x + \frac{23}{3} \ln|x-4| - \frac{5}{3} \ln|x+2| + C$

27.  $x - \ln(1+e^x) + C$  29.  $15 + 7 \ln \frac{2}{7}$

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.  $\theta \operatorname{tg} \theta - \frac{1}{2} \theta^2 - \ln|\sec \theta| + C$  43.  $\frac{2}{3} (1+e^x)^{3/2} + C$

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

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

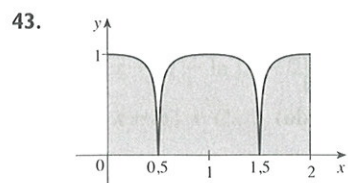




27.	$n$	$T_n$	$M_n$	$Sn$
	6	6,695473	6,252572	6,403292
	12	6,474023	6,363008	6,400206
	$n$	$E_T$	$E_M$	$E_S$
	6	-0,295473	0,147428	-0,003292
	12	-0,074023	0,036992	-0,000206

As observações são as mesmas que as de depois do Exemplo 1.

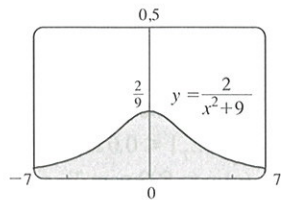
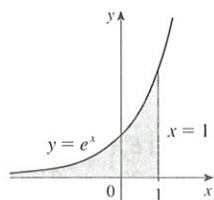
29. (a) 19,8      (b) 20,6      (c)  $20,5\bar{3}$   
 31. (a) 23,44      (b)  $0,341\bar{3}$       33. 18,8 m/s  
 35.  $1,0337 \times 10^5$  megawatt-horas  
 37. 828      39. 6,0      41. 59,4



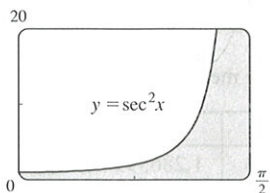
**EXERCÍCIOS 7.8 ■ PÁGINA 487**

Abreviações: C, convergente; D, divergente

1. (a) Intervalo infinito      (b) Descontinuidade infinita  
 (c) Descontinuidade infinita      (d) Intervalo infinito  
 3.  $\frac{1}{2} - 1/(2t^2)$ ; 0,495, 0,49995, 0,4999995; 0,5  
 5.  $\frac{1}{12}$     7. D    9.  $2e^{-2}$     11. D    13. 0    15. D  
 17. D    19.  $e^2/4$     21. D    23.  $\pi/9$   
 25.  $\frac{1}{2}$     27. D    29.  $\frac{32}{3}$     31. D    33.  $\frac{75}{4}$   
 35. D    37.  $-2/e$     39.  $\frac{8}{3} \ln 2 - \frac{8}{9}$   
 41.  $e$       43.  $2\pi/3$

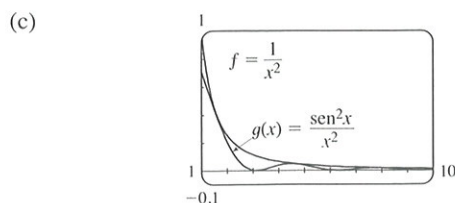


45. Área infinita

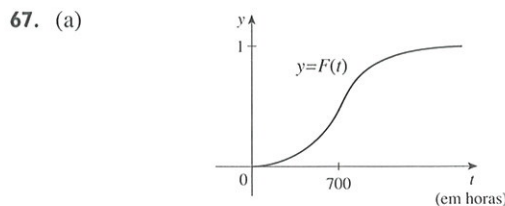


47. (a)

$t$	$\int_1^t [(\sin^2 x)/x^2] dx$	Parece que a integral é convergente.
2	0,447453	
5	0,577101	
10	0,621306	
100	0,668479	
1 000	0,672957	
10 000	0,673407	



49. C    51. D    53. D    55.  $\pi$     57.  $p < 1, 1/(1-p)$   
 59.  $p > -1, -1/(p+1)^2$     65.  $\sqrt{2GM/R}$



- (b) A taxa na qual a fração  $F(t)$  aumenta à medida que  $t$  aumenta  
 (c) 1; todas as lâmpada queimam eventualmente

69. 1 000  
 71. (a)  $F(s) = 1/s, s > 0$       (b)  $F(s) = 1/(s-1), s > 1$   
 (c)  $F(s) = 1/s^2, s > 0$   
 77. C = 1;  $\ln 2$     79. Não

**CAPÍTULO 7 REVISÃO ■ PÁGINA 490**

Teste Verdadeiro-Falso

1. Falso      3. Falso      5. Falso      7. Falso  
 9. (a) Verdadeiro      (b) Falso      11. Falso      13. Falso

Exercícios

1.  $5 + 10 \ln \frac{2}{3}$       3.  $\ln 2$       5.  $\frac{2}{15}$   
 7.  $-\cos(\ln t) + C$       9.  $\frac{64}{5} \ln 4 - \frac{124}{25}$   
 11.  $\sqrt{3} - \frac{1}{3}\pi$       13.  $3e^{\sqrt{x}} (\sqrt[3]{x^2} - 2\sqrt[3]{x} + 2) + C$   
 15.  $-\frac{1}{2} \ln |x| + \frac{3}{2} \ln |x+2| + C$   
 17.  $x \sec x - \ln |\sec x + \operatorname{tg} x| + C$   
 19.  $\frac{1}{18} \ln(9x^2 + 6x + 5) + \frac{1}{9} \operatorname{tg}^{-1}[\frac{1}{2}(3x+1)] + C$   
 21.  $\ln |x - 2 + \sqrt{x^2 - 4x}| + C$   
 23.  $\ln \left| \frac{\sqrt{x^2 + 1} - 1}{x} \right| + C$   
 25.  $\frac{3}{2} \ln(x^2 + 1) - 3 \operatorname{tg}^{-1} x + \sqrt{2} \operatorname{tg}^{-1}(x/\sqrt{2}) + C$   
 27.  $\frac{2}{5}$     29. 0    31.  $6 - \frac{3}{2}\pi$   
 33.  $\frac{x}{\sqrt{4-x^2}} - \operatorname{sen}^{-1}\left(\frac{x}{2}\right) + C$   
 35.  $4\sqrt{1+\sqrt{x}} + C$       37.  $\frac{1}{2} \operatorname{sen} 2x - \frac{1}{8} \cos 4x + C$   
 39.  $\frac{1}{8} e^{-\frac{1}{4}}$       41.  $\frac{1}{36}$       43. D  
 45.  $4 \ln 4 - 8$       47.  $-\frac{4}{3}$       49.  $\pi/4$   
 51.  $(x+1) \ln(x^2 + 2x + 2) + 2 \operatorname{arctg}(x+1) - 2x + C$

53. 0  
 55.  $\frac{1}{4}(2x - 1)\sqrt{4x^2 - 4x - 3} - \ln|2x - 1 + \sqrt{4x^2 - 4x - 3}| + C$   
 57.  $\frac{1}{2} \operatorname{sen} x \sqrt{4 + \operatorname{sen}^2 x} + 2 \ln(\operatorname{sen} x + \sqrt{4 + \operatorname{sen}^2 x}) + C$   
 61. Não  
 63. (a) 1,925444 (b) 1,920915 (c) 1,922470  
 65. (a) 0,01348,  $n \geq 368$  (b) 0,00674,  $n \geq 260$

67. 13,7 km  
 69. (a) 3,8 (b) 1,7867, 0,000646 (c)  $n \geq 30$   
 71. C 73. 2 75.  $\frac{3}{16} \pi^2$

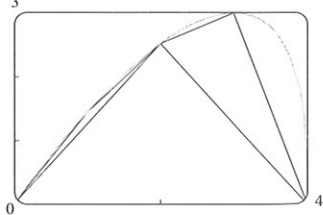
**PROBLEMAS QUENTES ■ PÁGINA 494**

1. Há aproximadamente 4,77 cm do centro 3. 0  
 7.  $f(\pi) = -\pi/2$  11.  $(b^b a^{-a})^{1/(b-a)} e^{-1}$   
 13.  $2 - \operatorname{sen}^{-1}(2/\sqrt{5})$

**CAPÍTULO 8**

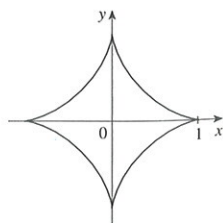
**EXERCÍCIOS 8.1 ■ PÁGINA 502**

1.  $4\sqrt{5}$  3.  $\int_0^1 \sqrt{1 + 9x^4} dx$  5.  $\int_1^4 \sqrt{9y^4 + 6y^2 + 2} dy$   
 7.  $\frac{2}{243}(82\sqrt{82} - 1)$  9.  $\frac{1261}{240}$  11.  $\frac{32}{3}$   
 13.  $\ln(\sqrt{2} + 1)$  15.  $\ln 3 - \frac{1}{2}$   
 17.  $\sqrt{1 + e^2} - \sqrt{2} + \ln(\sqrt{1 + e^2} - 1) - 1 - \ln(\sqrt{2} - 1)$   
 19.  $\int_0^1 \sqrt{1 + 9x^4} dx$  21.  $\frac{46}{3}$  23. 5,115840  
 25. 1,569619  
 27. (a), (b) 3



$L_1 = 4,$   
 $L_2 \approx 6,43,$   
 $L_4 \approx 7,50$

- (c)  $\int_0^4 \sqrt{1 + [4(3-x)/(3(4-x)^2)]^2} dx$  (d) 7,7988  
 29.  $\sqrt{5} - \ln(\frac{1}{2}(1 + \sqrt{5})) - \sqrt{2} + \ln(1 + \sqrt{2})$   
 31. 6



33.  $s(x) = \frac{2}{27}[(1 + 9x)^{3/2} - 10\sqrt{10}]$  35.  $2\sqrt{2}(\sqrt{1+x} - 1)$   
 37. 209,1 m 39. 62,55 cm 41. 12,4

**EXERCÍCIOS 8.2 ■ PÁGINA 508**

1. (a)  $\int_0^1 2\pi x^4 \sqrt{1 + 16x^6} dx$  (b)  $\int_0^1 2\pi x \sqrt{1 + 16x^6} dx$   
 3. (a)  $\int_0^1 2\pi \operatorname{tg}^{-1} x \sqrt{1 + \frac{1}{(1+x^2)^2}} dx$   
 (b)  $\int_0^1 2\pi x \sqrt{1 + \frac{1}{(1+x^2)^2}} dx$   
 5.  $\frac{1}{27} \pi(145\sqrt{145} - 1)$  7.  $\frac{98}{3} \pi$   
 9.  $\pi [1 + \frac{1}{4}(e^2 - e^{-2})]$  11.  $\frac{21}{2} \pi$   
 13.  $\frac{1}{27} \pi(145\sqrt{145} - 10\sqrt{10})$  15.  $\pi a^2$   
 17. 9,023754 19. 13,527296  
 21.  $\frac{1}{4} \pi [4 \ln(\sqrt{17} + 4) - 4 \ln(\sqrt{2} + 1) - \sqrt{17} + 4\sqrt{2}]$   
 23.  $\frac{1}{6} \pi [\ln(\sqrt{10} + 3) + 3\sqrt{10}]$   
 27. (a)  $\frac{1}{3} \pi a^2$  (b)  $\frac{56}{45} \pi \sqrt{3} a^2$   
 29. (a)  $2\pi \left[ b^2 + \frac{a^2 b \operatorname{sen}^{-1}(\sqrt{a^2 - b^2/a})}{\sqrt{a^2 - b^2}} \right]$

(b)  $2\pi \left[ a^2 + \frac{ab^2 \operatorname{sen}^{-1}(\sqrt{b^2 - a^2/b})}{\sqrt{b^2 - a^2}} \right]$

31.  $\int_a^b 2\pi [c - f(x)] \sqrt{1 + [f'(x)]^2} dx$  33.  $4\pi^2 r^2$

**EXERCÍCIOS 8.3 ■ PÁGINA 517**

1. (a) 187,5 lb/pé<sup>2</sup> (b) 1 875 lb (c) 562,5 lb  
 3. 6 000 lb 5.  $6,7 \times 10^4$  N 7.  $9,8 \times 10^3$  N  
 9.  $1,2 \times 10^4$  lb<sup>2</sup> 11.  $\frac{2}{3} \delta ah$  13.  $5,27 \times 10^5$  N  
 15. (a) 314 N (b) 353 N  
 17. (a)  $4,9 \times 10^4$  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  
 19.  $2,5 \times 10^5$  N 21. 230;  $\frac{23}{7}$  23. 10; 1;  $(\frac{1}{21}, \frac{10}{21})$   
 25. (0, 1,6) 27.  $(\frac{1}{e-1}, \frac{e+1}{4})$  29.  $(\frac{2}{5}, \frac{1}{2})$

31.  $(\frac{\pi\sqrt{2}-4}{4(\sqrt{2}-1)}, \frac{1}{4(\sqrt{2}-1)})$  33. (2, 0)

35. 60; 160;  $(\frac{8}{3}, 1)$  37. (0,781, 1,330) 41. (0,  $\frac{1}{12}$ )  
 45.  $\frac{1}{3} \pi r^2 h$

**EXERCÍCIOS 8.4 ■ PÁGINA 523**

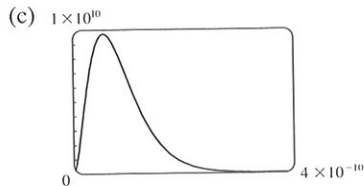
1. \$38 000 3. \$43 866 933,33 5. \$407,25  
 7. \$12 000 9. 3 727; \$37 753  
 11.  $\frac{2}{3} (16\sqrt{2} - 8) \approx \$9,75$  milhões 13.  $\frac{(1-k)(b^{2-k} - a^{2-k})}{(2-k)(b^{1-k} - a^{1-k})}$   
 15.  $1,19 \times 10^4$  cm<sup>3</sup>/s

17. 6,60 L/min

19. 5,77 L/min

**EXERCÍCIOS 8.5 ■ PÁGINA 530**

1. (a) A probabilidade de que um pneu escolhido aleatoriamente tenha uma duração entre 30 000 e 40 000 km  
 (b) A probabilidade de que um pneu escolhido aleatoriamente tenha uma duração de pelo menos 25 000 km
3. (a)  $f(x) \geq 0$  para todo  $x$  e  $\int_{-\infty}^{\infty} f(x) dx = 1$   
 (b)  $1 - \frac{3}{8}\sqrt{3} \approx 0,35$
5. (a)  $1/\pi$  (b)  $\frac{1}{2}$
7. (a)  $f(x) \geq 0$  para todo  $x$  e  $\int_{-\infty}^{\infty} f(x) dx = 1$  (b) 5
11. (a)  $e^{-4/2,5} \approx 0,20$  (b)  $1 - e^{-2/2,5} \approx 0,55$   
 (c) Se você não for servido em 10 minutos, ganha um hambúrguer de graça.
13.  $\approx 36\%$
15. (a) 0,0668 (b)  $\approx 5,21\%$
17.  $\approx 0,9545$
19. (b) 0;  $a_0$



- (d)  $1 - 41e^{-8} \approx 0,986$  (e)  $\frac{3}{2}a_0$

**CAPÍTULO 8 REVISÃO ■ PÁGINA 532**

Exercícios

1.  $\frac{15}{2}$  3. (a)  $\frac{21}{16}$  (b)  $\frac{41}{10}\pi$  5. 3,292287 7.  $\frac{124}{5}$
9. 6 533 N 11.  $(\frac{8}{5}, 1)$  13.  $(2, \frac{2}{3})$  15.  $2\pi^2$
17. \$7 166,67
19. (a)  $f(x) \geq 0$  para todo  $x$  e  $\int_{-\infty}^{\infty} f(x) dx = 1$   
 (b)  $\approx 0,3455$  (c) 5, sim
21. (a)  $1 - e^{-3/8} \approx 0,31$  (b)  $e^{-5/4} \approx 0,29$   
 (c)  $8 \ln 2 \approx 5,55$  min

**PROBLEMAS QUENTES ■ PÁGINA 534**

1.  $\frac{2}{3}\pi - \frac{1}{2}\sqrt{3}$
3. (a)  $2\pi r(r \pm d)$  (b)  $\approx 8,69 \times 10^6$  km<sup>2</sup>  
 (d)  $\approx 2,03 \times 10^8$  km<sup>2</sup>
5. (a)  $P(z) = P_0 + g \int_0^z \rho(x) dx$   
 (b)  $(P_0 - \rho_0 g H)(\pi r^2) + \rho_0 g H e^{L/H} \int_{-r}^r e^{-x/H} \cdot 2\sqrt{r^2 - x^2} dx$
7. Altura  $\sqrt{2}b$ , volume  $(\frac{28}{27}\sqrt{6} - 2) \pi b^3$  9. 0,14 m
11.  $2/\pi, 1/\pi$