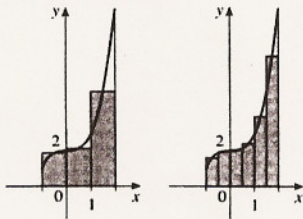


# RESPOSTAS:

## LISTAS 7, 8, 9 e 10.

(c) 9,375, 9,65625

(d)  $M_6$



7. 1,9835; 1,9982; 1,9993; 2

9. (a) Esquerda: 4,5148, 4,6165, 4,6366, direita: 4,8148, 4,7165, 4,6966

11. 34,7 pés; 44,8 pés 13. 155 pés

15.  $\lim_{n \rightarrow \infty} \frac{8}{n} \sum_{i=1}^n \sqrt[3]{8i/n}$

17.  $\lim_{n \rightarrow \infty} \frac{4}{n} \sum_{i=1}^n \left[ 2 + \frac{4i}{n} + \ln \left( 2 + \frac{4i}{n} \right) \right]$

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

21. (a)  $\lim_{n \rightarrow \infty} \frac{64}{n^6} \sum_{i=1}^n i^5$

(b)  $n^2(n+1)^2(2n^2+2n-1)/12$  (c)  $\frac{32}{3}$

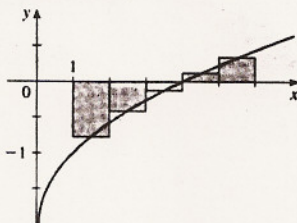
23.  $\operatorname{sen} b, 1$

### Exercícios 5.2 □

1. 0,25

3. -0,856759

A soma de Riemann representa a soma das áreas de 2 retângulos acima do eixo  $x$  menos a soma das áreas dos 3 retângulos abaixo do eixo  $x$ .



5. (a) 4 (b) 6 (c) 10 7. Abaixo = -475, acima = -85

9. 6,4643 11. 1,8100

13. 1,81001414, 1,81007263, 1,81008347 15.  $\int_0^\pi x \operatorname{sen} x \, dx$

17.  $\int_0^1 (2x^2 - 5x) \, dx$  19. 42 21.  $\frac{4}{3}$  23. 3,75

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

29. (a) 4 (b) 10 (c) -3 (d) 2 31. 10

33.  $3 + 9\pi/4$  35. 0 37.  $-\frac{38}{3}$  39. 3 41.  $e^5 - e^3$

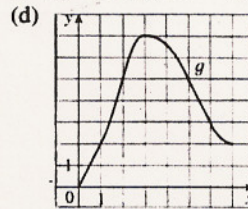
43.  $\int_1^{12} f(x) \, dx$  45. -0,8 51.  $\frac{1}{2} \leq \int_1^2 dx/x \leq 1$

53.  $-3 \leq \int_{-3}^0 (x^2 + 2x) \, dx \leq 9$

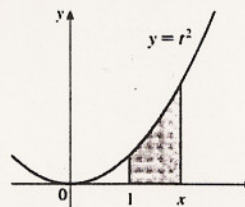
55.  $0 \leq \int_0^2 xe^{-x} \, dx \leq 2/e$  63.  $\int_0^1 x^4 \, dx$  65.  $\frac{1}{2}$

### Exercícios 5.3 □

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



3. (a) e (b)  $x^2$



5.  $g'(x) = \sqrt{1+2x}$  7.  $g'(y) = y^2 \operatorname{sen} y$

9.  $F'(x) = -\cos(x^2)$  11.  $h'(x) = -\operatorname{arctg}(1/x)/x^2$

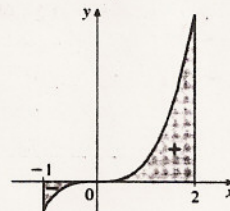
13.  $\frac{\cos \sqrt{x}}{2x}$  15.  $\frac{3(1-3x)^3}{1+(1-3x)^2}$  17.  $\frac{364}{3}$  19. 138

21.  $\frac{16}{3}$  23.  $\frac{7}{8}$  25. 0 27. Não existe

29.  $(\sqrt{2}-1)/2$  31. Não existe 33.  $\ln 3$

35.  $2^8/\ln 2$  37.  $\pi/2$  39. 10,7 41.  $\frac{243}{4}$  43. 2

45. 3,75



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

49.  $y' = 3x^{7/2} \operatorname{sen}(x^3) - (\operatorname{sen} \sqrt{x})/(2\sqrt{x})$  51.  $\sqrt[3]{257}$

53. (a)  $-2\sqrt{n}, \sqrt{4n-2}$ ,  $n$  é um inteiro  $> 0$

(b) (0, 1),  $(-\sqrt{4n-1}, -\sqrt{4n-3})$ , e  $(\sqrt{4n-1}, \sqrt{4n+1})$ ,  $n$  é um inteiro  $> 0$

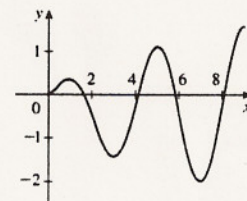
(c) 0,7

55. (a) Máximo em 1 e 5; mínimo em 3 e 7

(b) 9

(c)  $(\frac{1}{2}, 2), (4, 6), (8, 9)$

(d) Veja o gráfico.



57.  $\frac{1}{4}$  63.  $f(x) = x^{3/2}$ ,  $a = 9$

65. (b) Gasto médio sobre  $[0, t]$ ; gasto médio minimizado.

### Exercícios 5.4 □

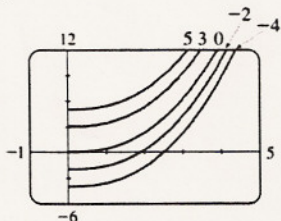
5.  $4x^{1/4} + C$  7.  $\frac{1}{4}x^4 + 3x^2 + x + C$

9.  $2t - t^2 + \frac{1}{3}t^3 - \frac{1}{4}t^4 + C$  11.  $4x - \frac{8}{3}x^{3/2} + \frac{1}{2}x^2 + C$



13.  $\sec x + C$

15.  $\frac{2}{3}x^{5/2} + C$

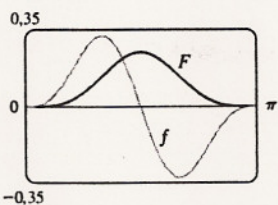
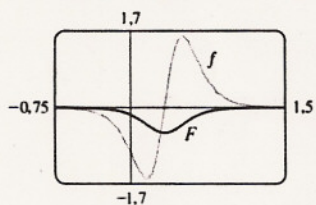


17. -1    19.  $-2 + 1/e$   
 21.  $\frac{28}{81}$     23.  $6(3\sqrt{2} - 2)/5$     25.  $\frac{29}{35}$     27.  $2\sqrt{5}$   
 29.  $\frac{28}{3}$     31.  $\frac{2}{3}$     33.  $\frac{1}{4}$     35.  $2\sqrt{3}/3$     37.  $1 + \pi/4$   
 39.  $\frac{1}{2}e^2 + e - \frac{1}{2}$     41. -3,5    43. 0, 1,32; 0,84    45.  $\frac{4}{3}$

47. O aumento do peso da criança (em libras) entre as idades de 5 e 10 anos.  
 49. Número de galões de óleo derramados nas 2 primeiras horas.  
 51. Aumento no rendimento quando a produção estiver crescendo de 1000 a 5000 unidades.  
 53. (a)  $-\frac{3}{2}$  m    (b)  $\frac{41}{6}$  m  
 55. (a)  $v(t) = \frac{1}{2}t^2 + 4t + 5$  m/s    (b)  $416\frac{2}{3}$  m    57.  $46\frac{2}{3}$  kg  
 59. 1,4 mi    61. \$ 58.000    63. (b) Mais de 40%;  $\frac{5}{36}$

**Exercícios 5.5** □

1.  $\frac{1}{3} \sin 3x + C$     3.  $\frac{2}{9}(x^3 + 1)^{3/2} + C$   
 5.  $-1/(1 + 2x)^2 + C$     7.  $\frac{1}{3}(x^2 + 3)^5 + C$   
 9.  $\frac{2}{3}(x - 1)^{3/2} + C$     11.  $-\frac{1}{3} \ln|5 - 3x| + C$   
 13.  $2\sqrt{1 + x + 2x^2} + C$     15.  $-2/[5(t + 1)^5] + C$   
 17.  $-(1 - 2y)^{2/3}/4,6 + C$     19.  $\frac{1}{2} \sin 2\theta + C$   
 21.  $(\ln x)^3/3 + C$     23.  $-\frac{1}{2} \cos(t^2) + C$   
 25.  $\frac{2}{3}(1 + \sec x)^{3/2} + C$     27.  $\frac{2}{3}(1 + e^x)^{3/2} + C$   
 29.  $-\frac{1}{5} \cos^2 x + C$     31.  $\ln|\ln x| + C$   
 33.  $-\frac{2}{3}(\cot x)^{3/2} + C$     35.  $\frac{1}{2} \ln|x^2 + 2x| + C$   
 37.  $\frac{1}{3} \sec^3 x + C$     39.  $2(b + cx^{a+1})^{3/2}/[3c(a + 1)] + C$   
 41.  $\operatorname{tg}^{-1} x + \frac{1}{2} \ln(1 + x^2) + C$   
 43.  $\frac{4}{7}(x + 2)^{7/4} - \frac{8}{3}(x + 2)^{3/4} + C$   
 45.  $\frac{-1}{6(3x^2 - 2x + 1)^3} + C$     47.  $\frac{1}{4} \sin^4 x + C$



49. 0    51.  $\frac{182}{9}$     53. 0    55.  $(4\sqrt{2}/3) - (5\sqrt{5}/12)$   
 57.  $\frac{1}{2} \ln 3$     59. 1    61. 3    63.  $\frac{16}{15}$     65. 2  
 67. Não existe    69.  $\frac{1}{3}(2\sqrt{2} - 1)a^3$     71.  $\sqrt{3} - \frac{1}{3}$   
 73.  $6\pi$     75.  $[5/(4\pi)][1 - \cos(2\pi t/5)]L$     77. 5  
 83.  $\pi^2/4$

**Exercícios 5.6** □

1. (b) 0,405

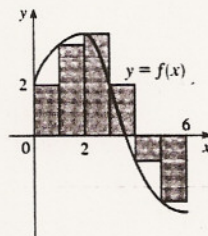
**Capítulo 5 Revisão** □

**Testes Falso-Verdadeiro**

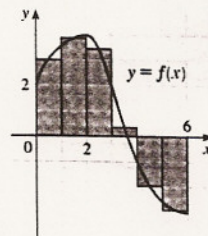
1. Verdadeiro    3. Verdadeiro    5. Falso    7. Verdadeiro  
 9. Verdadeiro    11. Falso    13. Falso

**Exercícios**

1. (a) 8



- (b) 5,6



3.  $\frac{1}{2} + \pi/4$     5. 3    7.  $f = c, f' = b, \int_0^x f(t) dt = a$

9. 37    11.  $\frac{9}{10}$     13.  $\frac{1209}{28}$     15. 3480    17. 2  
 19. Não existe    21.  $(1/\pi)(e^\pi - 1)$     23.  $\ln 2 - \frac{7}{4}$   
 25.  $-1/[25(2 + x^5)^5] + C$     27.  $-(\cos \pi x)/\pi + C$   
 29.  $-\sin(1/t) + C$     31.  $2e^{\sqrt{x}} + C$

33.  $-\frac{1}{2}[\ln(\cos x)]^2 + C$     35.  $\frac{1}{4} \ln(1 + x^4) + C$   
 37.  $\ln|1 + \sec \theta| + C$     39. 4    41.  $2\sqrt{1 + \sin x} + C$   
 43.  $\frac{64}{5}$     45.  $F'(x) = \sqrt{1 + x^4}$     47.  $g'(x) = 3x^5/\sqrt{1 + x^9}$

49.  $y' = (2e^x - e^{\sqrt{x}})/(2x)$     51.  $4 \leq \int_1^3 \sqrt{x^2 + 3} dx \leq 4\sqrt{3}$

57. 1,11    59. 30,4    61. 72,400

63.  $F(x) = \int_1^x t^2 \sin(t^2) dt$     65.  $c \approx 1,62$

67.  $(1 + x^2)(x \cos x + \sin x)/x^2$

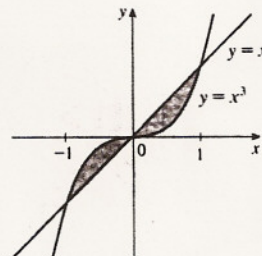
**Problemas Quentes** □

1.  $\pi/2$     5. -1    7. -1    9.  $[-1, 2]$   
 11. (a)  $(n - 1)n/2$   
 (b)  $\frac{1}{2}[[b](2b - [b]) - 1] - \frac{1}{2}[[a](2a - [a]) - 1]$   
 13.  $f(x) = \frac{1}{2}x$  ou  $f(x) = 0$     17.  $2(\sqrt{2} - 1)$     19.  $\frac{2}{3}$

**Capítulo 6**

**Exercícios 6.1** □

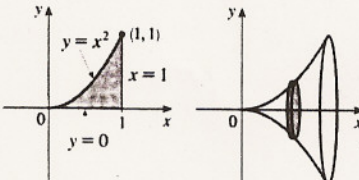
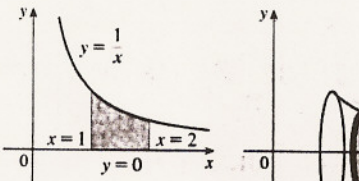
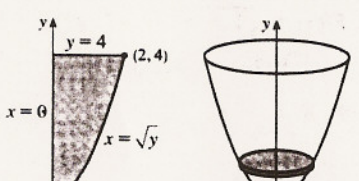
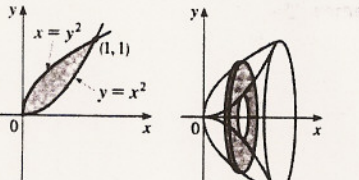
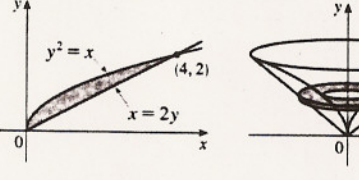
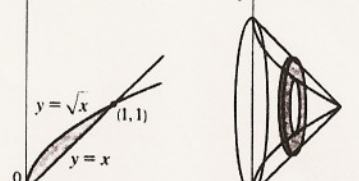
1.  $\frac{20}{3}$     3.  $\frac{8}{3}$     5. 19,5    7.  $\frac{1}{6}$     9.  $\ln 2 - \frac{1}{2}$     11.  $\frac{1}{3}$   
 13. 4    15.  $\frac{31}{6}$     17.  $\frac{32}{3}$     19.  $\frac{8}{3}$     21.  $\frac{1}{2}$     23.  $2 - \pi/2$   
 25.  $\pi - \frac{2}{3}$     27. 6,5  
 29.  $\frac{1}{2}$



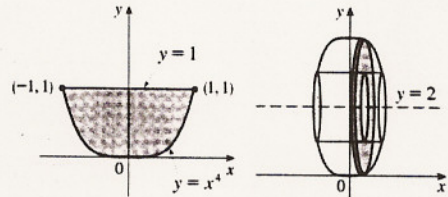


31. 3,22    33. -1,02, 1,02; 2,70    35. -0,75, 0,75; 0,98  
 37. 0, 1,19; 0,83    39.  $117\frac{1}{3}$  pés  
 41. (a) Carro A (b) A distância na qual A está na frente de B depois de 1 minuto (c) Carro A (d)  $t \approx 2,2$  min  
 43.  $24\sqrt{3}/5$     45.  $4^{2/3}$     47.  $\pm 6$   
 49.  $0 < m < 1; m - \ln m - 1$

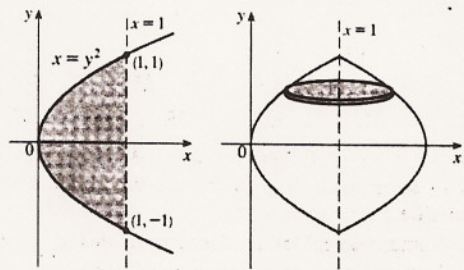
Exercícios 6.2 □

1.  $\pi/5$
- 
3.  $\pi/2$
- 
5.  $8\pi$
- 
7.  $3\pi/10$
- 
9.  $64\pi/15$
- 
11.  $\pi/6$
- 

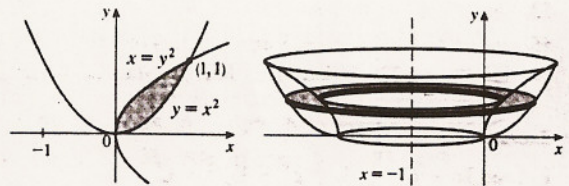
13.  $208\pi/45$



15.  $16\pi/15$



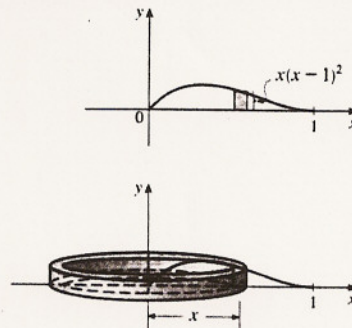
17.  $29\pi/30$



19.  $32\pi/3$     21.  $128\pi/3$     23.  $128\pi/15$     25.  $112\pi/15$   
 27.  $64\pi/5$     29.  $16\pi/5$     31.  $\pi \int_1^e [1^2 - (\ln x)^2] dx$   
 33.  $\pi \int_0^\pi [1^2 - (1 - \sin x)^2] dx$   
 35.  $\pi \int_{-\sqrt{8}}^{\sqrt{8}} [3 - (-2)]^2 - [\sqrt{y^2 + 1} - (-2)]^2 dy$   
 37. 0, 0,747; 0,132  
 39. Sólido obtido fazendo-se girar a região  $0 \leq y \leq \cos x, 0 \leq x \leq \pi/2$  em torno do eixo  $x$ .  
 41. Sólido obtido fazendo-se girar a região acima do eixo  $x$  limitado por  $x = y^2$  e  $x = y^4$  em torno do eixo  $y$ .  
 43.  $1110 \text{ cm}^3$     45.  $\pi r^2 h/3$     47.  $\pi h^2 [r - (h/3)]$   
 49.  $2b^2 h/3$     51.  $10 \text{ cm}^3$     53. 24    55. 2    57. 3  
 59. (a)  $8\pi R \int_0^r \sqrt{r^2 - y^2} dy$  (b)  $2\pi^2 r^2 R$     61. (b)  $\pi r^2 h$   
 63.  $\frac{5}{12} \pi r^3$     65.  $8 \int_0^r \sqrt{R^2 - y^2} \sqrt{r^2 - y^2} dy$

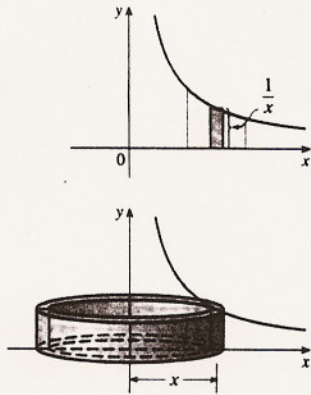
Exercícios 6.3 □

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



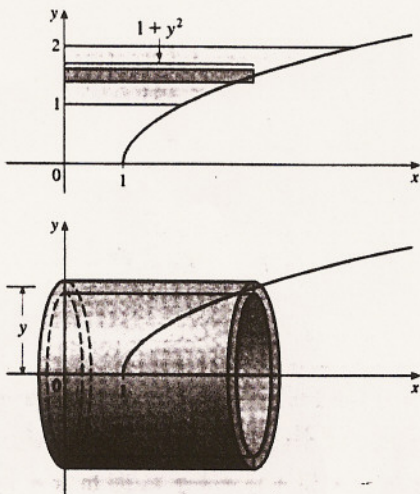


3.  $2\pi$



5.  $\pi(1 - 1/e)$     7.  $64\pi/15$

9.  $21\pi/2$



11.  $1944\pi/5$     13.  $5\pi/6$     15.  $17\pi/6$     17.  $67\pi/6$

19.  $24\pi$     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. 1,142

29. Sólido obtido fazendo-se girar a região embaixo de  $y = \cos x$  de  $0$  a  $\pi/2$  em torno do eixo  $y$ .

31. Sólido obtido fazendo-se girar a região limitada por  $y = x^2$  e  $y = x^6$  em torno do eixo  $y$ .

33. 0, 1,32; 4,05    35.  $81\pi/10$     37.  $2\pi(12 - 4 \ln 4)$

39.  $4\pi/3$     41.  $\frac{4}{3}\pi r^3$     43.  $\frac{1}{3}\pi r^2 h$

**Exercícios 6.4** □

1. 7200 J    3. 9 pés-lb    5.  $\frac{15}{4}$  pés-lb    7.  $\frac{25}{24} \approx 1,04$  J

9. 10,8 cm    11. 625 pés-lb    13. 650.000 pés-lb

15.  $\approx 2,45 \times 10^3$  J    17.  $\approx 1,06 \times 10^6$  J

19.  $\approx 5,8 \times 10^3$  pés-lb    21. 2,0 m

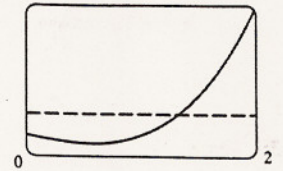
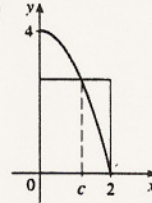
25.  $Gm_1m_2[(1/a) - (1/b)]$

**Exercícios 6.5** □

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

9. (a)  $\frac{8}{3}$     (b)  $2/\sqrt{3}$     11. (a) 2    (b)  $\approx 1,32$

(c)  $\frac{7}{4}$



15.  $(50 + 28/\pi)^\circ\text{F} \approx 59^\circ\text{F}$     17. 6 kg/m

19.  $5/(4\pi) \approx 0,4$  L

**Capítulo 6 Revisão** □

**Exercícios**

1.  $\frac{125}{6}$     3.  $e - \frac{11}{6}$     5.  $2\sqrt{2}$     7.  $2\pi$     9.  $16\pi/3$

11.  $4\pi(2ah + h^2)^{3/2}/3$     13.  $\int_0^1 \pi[(1-x^3)^2 - (1-x^2)^2] \, dx$

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

17. (a) 0,38    (b) 0,87

19. Sólido obtido fazendo-se girar a região  $0 \leq y \leq \cos x$ ,  $0 \leq x \leq \pi/2$  em torno do eixo  $y$ .

21. Sólido obtido fazendo-se girar a região no primeiro quadrante limitada por  $x = 4 - y^2$  e os eixos em torno do eixo  $x$ .

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

29. (a)  $8000\pi/3$  pés-lb    (b) 2,1 pés    31.  $f(x)$

**Problemas Quentes** □

1.  $f(t) = 3t^2$     3.  $f(x) = \sqrt{2x/\pi}$

5. (b) 0,2261    (c) 0,6736 m

(d) (i)  $1/(105\pi) \approx 0,003$  pol/s    (ii)  $370\pi/3 \text{ s} \approx 6,5$  min

9.  $y = \frac{32}{9}x^2$

11. (a)  $V = \int_0^h \pi[f(y)]^2 \, dy$

(c)  $f(y) = \sqrt{kA/(\pi C)} y^{1/4}$ . Vantagens; as marcas sobre o contêiner estão igualmente espaçadas.

13.  $B = 16A$

**Capítulo 7**

**Exercícios 7.1** □

1.  $\frac{1}{2}x^2 \ln x - \frac{1}{4}x^2 + C$     3.  $(xe^{2x}/2) - (e^{2x}/4) + C$

5.  $-\frac{1}{4}x \cos 4x + \frac{1}{16} \sin 4x + C$

7.  $\frac{1}{3}x^2 \sin 3x + \frac{2}{9}x \cos 3x - \frac{2}{27} \sin 3x + C$

9.  $x(\ln x)^2 - 2x \ln x + 2x + C$

11.  $e^{2\theta}(2 \sin 3\theta - 3 \cos 3\theta)/13 + C$

13.  $y \cosh y - \sinh y + C$     15.  $1 - 2/e$     17.  $\frac{1}{2} - \frac{1}{2} \ln 2$

19.  $4 \ln 2 - \frac{3}{2}$     21.  $(\pi + 6 - 3\sqrt{3})/6$

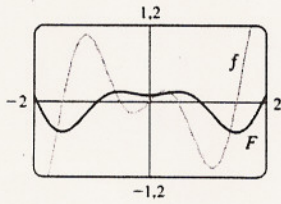
23.  $\sin x (\ln \sin x - 1) + C$     25.  $x(\cos \ln x + \sin \ln x)/2 + C$

27.  $\frac{32}{5}(\ln 2)^2 - \frac{64}{25} \ln 2 + \frac{62}{125}$     29.  $2(\sin \sqrt{x} - \sqrt{x} \cos \sqrt{x}) + C$

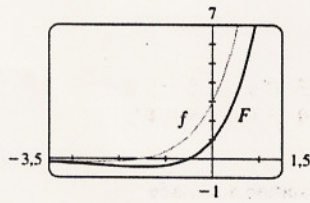
31.  $-\frac{1}{2} - \pi/4$



33.  $(x \operatorname{sen} \pi x)/\pi + (\cos \pi x)/\pi^2 + C$



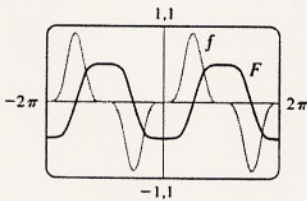
35.  $(2x + 1)e^x + C$



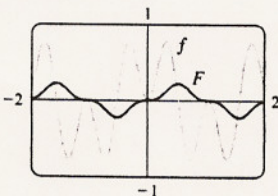
37. (b)  $-\frac{1}{4} \cos x \operatorname{sen}^3 x + (3x/8) - \frac{3}{16} \operatorname{sen} 2x + C$   
 39. (b)  $\frac{2}{3}, \frac{8}{15}$  45.  $x[(\ln x)^3 - 3(\ln x)^2 + 6 \ln x - 6] + C$   
 47.  $(\pi + 6\sqrt{3} - 12)/12$  49. 0, 0,70; 0,08 51.  $10\pi^2$   
 53.  $2\pi e$  55.  $-1/\pi$  57.  $2 - e^{-(t^2 + 2t + 2)} m$  61. 1

**Exercícios 7.2** □

1.  $\frac{1}{5} \cos^5 x - \frac{1}{3} \cos^3 x + C$  3.  $-\frac{11}{384}$   
 5.  $\frac{1}{5} \operatorname{sen}^5 x - \frac{2}{7} \operatorname{sen}^7 x + \frac{1}{9} \operatorname{sen}^9 x + C$  7.  $\pi/4$   
 9.  $\frac{3}{8} x + \frac{1}{4} \operatorname{sen} 2x + \frac{1}{32} \operatorname{sen} 4x + C$   
 11.  $(3x/2) + \cos 2x - \frac{1}{8} \operatorname{sen} 4x + C$  13.  $(3\pi - 4)/192$   
 15.  $[\frac{2}{7} \cos^3 x - \frac{2}{3} \cos x] \sqrt{\cos x} + C$   
 17.  $\frac{1}{2} \cos^2 x - \ln |\cos x| + C$  19.  $\ln(1 + \operatorname{sen} x) + C$   
 21.  $\operatorname{tg} x - x + C$  23.  $\operatorname{tg} x + \frac{1}{3} \operatorname{tg}^3 x + C$  25.  $\frac{1}{5}$   
 27.  $\frac{1}{3} \sec^3 x - \sec x + C$  29.  $\frac{38}{15}$   
 31.  $\frac{1}{4} \sec^4 x - \operatorname{tg}^2 x + \ln |\sec x| + C$  33.  $\frac{1}{2} \operatorname{tg}^2 x + C$   
 35.  $\sqrt{3} - (\pi/3)$   
 37.  $-\frac{1}{3} \operatorname{cotg}^3 w - \frac{1}{5} \operatorname{cotg}^5 w + C$  39.  $\ln |\operatorname{cosec} x - \operatorname{cotg} x| + C$   
 41.  $\frac{1}{2} [\frac{1}{3} \operatorname{sen} 3x - \frac{1}{7} \operatorname{sen} 7x] + C$  43.  $\frac{1}{4} \operatorname{sen} 2\theta + \frac{1}{24} \operatorname{sen} 12\theta + C$   
 45.  $\frac{1}{2} \operatorname{sen} 2x + C$   
 47.  $-\frac{1}{3} \cos^5 x + \frac{2}{3} \cos^3 x - \cos x + C$



49.  $\frac{1}{6} \operatorname{sen} 3x - \frac{1}{18} \operatorname{sen} 9x + C$



51. 0 53.  $\frac{1}{3}$  55. 0 57.  $\pi^2/4$  59.  $2\pi + (\pi^2/4)$   
 61.  $s = (1 - \cos^3 \omega t)/(3\omega)$

**Exercícios 7.3** □

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.  $(1/\sqrt{3}) \ln |(\sqrt{x^2 + 3} - \sqrt{3})/x| + C$   
 11.  $\frac{1}{4} \operatorname{sen}^{-1}(2x) + \frac{1}{2} x \sqrt{1 - 4x^2} + C$   
 13.  $\sqrt{9x^2 - 4} - 2 \operatorname{sec}^{-1}(3x/2) + C$   
 15.  $(x/\sqrt{a^2 - x^2}) - \operatorname{sen}^{-1}(x/a) + C$  17.  $\sqrt{x^2 - 7} + C$   
 19.  $\ln(1 + \sqrt{2})$  21.  $\frac{64}{1215}$   
 23.  $\frac{1}{2} [\operatorname{sen}^{-1}(x - 1) + (x - 1)\sqrt{2x - x^2}] + C$   
 25.  $\frac{1}{3} \ln |3x + 1 + \sqrt{9x^2 + 6x - 8}| + C$   
 27.  $\frac{1}{2} [\operatorname{tg}^{-1}(x + 1) + (x + 1)/(x^2 + 2x + 2)] + C$   
 29.  $\frac{1}{2} [e'\sqrt{9 - e^{2t}} + 9 \operatorname{sen}^{-1}(e'/3)] + C$   
 33.  $3\pi/2$  37. 0,81, 2; 2,10  
 39.  $r\sqrt{R^2 - r^2} + \pi r^2/2 - R^2 \operatorname{arcsen}(r/R)$  41.  $2\pi^2 Rr^2$

**Exercícios 7.4** □

1.  $\frac{A}{2x + 3} + \frac{B}{x - 1}$  3.  $\frac{x^2 + 9x - 12}{(3x - 1)(x + 6)^2}$   
 5.  $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{D}{x - 1}$  7.  $1 + \frac{A}{x - 1} + \frac{B}{x + 1}$   
 9.  $\frac{Ax + B}{x^2 + 1} + \frac{Cx + D}{x^2 + 4} + \frac{Ex + F}{(x^2 + 4)^2}$   
 11.  $\frac{Ax + B}{x^2 + 9} + \frac{Cx + D}{(x^2 + 9)^2} + \frac{Ex + F}{(x^2 + 9)^3}$   
 13.  $\frac{1}{2} x^2 - x + \ln |x + 1| + C$   
 15.  $2 \ln |x + 5| - \ln |x - 2| + C$   
 17.  $x - \ln |x| + 2 \ln |x - 1| + C = x + \ln |(x - 1)^2/|x|| + C$   
 19.  $2 \ln 2 + \frac{1}{2}$  21.  $\frac{27}{5} \ln 2 - \frac{9}{5} \ln 3$  (ou  $\frac{9}{5} \ln \frac{8}{3}$ )  
 23.  $-\frac{1}{36} \ln |x + 5| + \frac{1}{6} \frac{1}{x + 5} + \frac{1}{36} \ln |x - 1| + C$   
 25.  $2 \ln |x| + 3 \ln |x + 2| + (1/x) + C$   
 27.  $\ln |x + 1| + 2/(x + 1) - 1/[2(x + 1)^2] + C$   
 29.  $(1 - \ln 2)/2$   
 31.  $\ln(x - 1)^2 + \ln \sqrt{x^2 + 1} - 3 \operatorname{tg}^{-1} x + C$   
 33.  $\frac{1}{2} \ln(t^2 + 1) + \frac{1}{2} \ln(t^2 + 2) - (1/\sqrt{2}) \operatorname{tg}^{-1}(t/\sqrt{2}) + C$   
 35.  $\frac{1}{3} \ln |x - 1| - \frac{1}{6} \ln(x^2 + x + 1) - \frac{1}{\sqrt{3}} \operatorname{tg}^{-1} \frac{2x + 1}{\sqrt{3}} + C$   
 37.  $\frac{1}{3} \ln \frac{17}{2}$   
 39.  $(1/x) + \frac{1}{2} \ln |(x - 1)/(x + 1)| + C$   
 41.  $\frac{-1}{2(x^2 + 2x + 4)} - \frac{2\sqrt{3}}{9} \operatorname{tg}^{-1} \left( \frac{x + 1}{\sqrt{3}} \right) - \frac{2(x + 1)}{3(x^2 + 2x + 4)} + C$   
 43.  $\ln |(\sqrt{x + 1} - 1)/(\sqrt{x + 1} + 1)| + C$  45.  $2 + \ln \frac{25}{9}$   
 47.  $\frac{3}{10}(x^2 + 1)^{5/3} - \frac{3}{4}(x^2 + 1)^{2/3} + C$   
 49.  $2\sqrt{x} + 3\sqrt[3]{x} + 6\sqrt{x} + 6 \ln |\sqrt[3]{x} - 1| + C$   
 51.  $\ln[(e^x + 2)^2/(e^x + 1)] + C$  53.  $-\frac{1}{2} \ln 3 \approx -0,55$   
 55.  $\frac{1}{2} \ln |(x - 2)/x| + C$  59.  $\frac{1}{5} \ln \left| \frac{2 \operatorname{tg}(x/2) - 1}{\operatorname{tg}(x/2) + 2} \right| + C$   
 61.  $\frac{1}{4} \ln |\operatorname{tg}(x/2)| + \frac{1}{8} \operatorname{tg}^2(x/2) + C$  63.  $1 + 2 \ln 2$   
 65.  $t = -\ln P - \frac{1}{9} \ln(0,9P + 900) + C$ , onde  $C \approx 10,23$



67. (a)  $\frac{24.110}{4879} \frac{1}{5x+2} - \frac{668}{323} \frac{1}{2x+1} - \frac{9438}{80.155} \frac{1}{3x-7} + \frac{1}{22.098x+48.935}$   
 260.015  $\frac{1}{x^2+x+5}$

(b)  $\frac{4822}{4879} \ln|5x+2| - \frac{334}{323} \ln|2x+1| - \frac{3146}{80.155} \ln|3x-7| + \frac{11.049}{260.015} \ln(x^2+x+5) + \frac{75.772}{260.015\sqrt{19}} \operatorname{tg}^{-1} \frac{2x+1}{\sqrt{19}} + C$

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

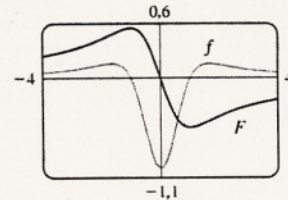
**Exercícios 7.5** □

1.  $\operatorname{tg}^{-1}(\operatorname{sen} x) + C$
3.  $e^{\pi/4} - e^{-\pi/4}$
5.  $\frac{1}{3} \operatorname{sen}^3 x - \frac{1}{5} \operatorname{sen}^5 x + C$
7.  $3 \ln|(3 - \sqrt{9-x^2})/x| + \sqrt{9-x^2} + C$
9.  $1 - \frac{1}{2} \sqrt{3}$
11.  $4 - \ln 9$
13.  $\frac{1}{2} \ln(x^2 - 4x + 5) + \operatorname{tg}^{-1}(x-2) + C$
15.  $e^{r^2} + C$
17.  $x \ln(1+x^2) - 2x + 2 \operatorname{tg}^{-1} x + C$
19.  $-\frac{1}{8} e^{-2t}(4t^3 + 6t^2 + 6t + 3) + C$
21.  $\frac{4097}{45}$
23.  $3x + \frac{23}{3} \ln|x-4| - \frac{5}{3} \ln|x+2| + C$
25.  $\frac{1}{2} (\ln \operatorname{sen} x)^2 + C$
27.  $\frac{86}{3}$
29.  $\operatorname{sen}^{-1} x - \sqrt{1-x^2} + C$
31.  $15 + 7i \ln \frac{2}{7}$
33.  $-\frac{3}{13} e^{2x} \cos 3x + \frac{2}{13} e^{2x} \operatorname{sen} 3x + C$
35. 0
37.  $\pi/8 - \frac{1}{4}$
39.  $-\ln(1 + \sqrt{1-x^2}) + C$
41.  $\theta \operatorname{tg} \theta - \frac{1}{2} \theta^2 - \ln|\sec \theta| + C$
43.  $-\frac{1}{3}(x^3 + 1)e^{-x^3} + C$
45.  $\ln \sqrt{x^2 + a^2} + \operatorname{tg}^{-1}(x/a) + C$
47.  $\frac{1}{16} x - (\operatorname{sen} 4\pi x)/(64\pi) + (\operatorname{sen}^3 2\pi x)/(48\pi) + C$
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.  $(1/m)x^2 \cosh(mx) - (2/m^2)x \operatorname{senh}(mx) + (2/m^3) \cosh(mx) + C$
55.  $3 \ln(\sqrt{x+1}+3) - \ln(\sqrt{x+1}+1) + C$
57.  $\frac{3}{7}(x+c)^{7/3} - \frac{3}{4}c(x+c)^{4/3} + C$
59.  $e^{-x} + \frac{1}{2} \ln|(e^x-1)/(e^x+1)| + C$
61.  $\frac{20}{3} \operatorname{tg}^{-1}(x^5/4) + C$
63.  $\frac{1}{6} \operatorname{cosec}^3 2x - \frac{1}{10} \operatorname{cosec}^5 2x + C$
65.  $\frac{2}{3} [(x+1)^{3/2} - x^{3/2}] + C$
67.  $2\sqrt{i} \operatorname{tg}^{-1} \sqrt{i} - \ln(1+i) + C$
69.  $e^x - \ln(1+e^x) + C$
71.  $-\frac{1}{4} \ln(x^2+3) + \frac{1}{4} \ln(x^2+1) + C$
73.  $\frac{1}{8} \ln|x-2| - \frac{1}{16} \ln(x^2+4) - \frac{1}{8} \operatorname{tg}^{-1}(x/2) + C$
75.  $\frac{3}{4} \cos 6x - \frac{1}{16} \cos 4x - \frac{1}{8} \cos 2x + C$

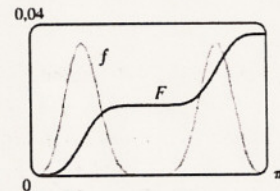
**Exercícios 7.6** □

1.  $(-1/x)\sqrt{7-2x^2} - \sqrt{2} \operatorname{sen}^{-1}(\sqrt{2}x/\sqrt{7}) + C$
3.  $(1/(2\pi)) \sec(\pi x) \operatorname{tg}(\pi x) + (1/(2\pi)) \ln|\sec(\pi x) + \operatorname{tg}(\pi x)| + C$
5.  $\pi/4$
7.  $\frac{1}{25} e^{-3x}(-3 \cos 4x + 4 \operatorname{sen} 4x) + C$
9.  $\frac{1}{2} [x^2 \operatorname{sen}^{-1}(x^2) + \sqrt{1-x^4}] + C$
11.  $e - 2$
13.  $(-\sqrt{9x^2-1}/x) + 3 \ln|3x + \sqrt{9x^2-1}| + C$
15.  $\operatorname{tg}^{-1}(\operatorname{senh} e^x) + C$
17.  $9\pi/4$
19.  $\frac{1}{3} \operatorname{sen}^3 x [3 \ln(\operatorname{sen} x) - 1] + C$
21.  $-2\sqrt{2+3 \cos x} - \sqrt{2} \ln \left| \frac{\sqrt{2+3 \cos x} - \sqrt{2}}{\sqrt{2+3 \cos x} + \sqrt{2}} \right| + C$

23.  $\frac{1}{4} \operatorname{tg} x \sec^3 x + \frac{3}{8} \operatorname{tg} x \sec x + \frac{3}{8} \ln|\sec x + \operatorname{tg} x| + C$
25.  $\frac{8}{15} \operatorname{tg} x \sec^3 x + \frac{3}{8} \operatorname{tg} x \sec x + \frac{3}{8} \ln|\sec x + \operatorname{tg} x| + C$
27.  $\sqrt{e^{2x}-1} - \cos^{-1}(e^{-x}) + C$
29.  $\frac{1}{3} \ln|x^5 + \sqrt{x^{10}-2}| + C$
31.  $(2\pi/25)(\ln 6 - \frac{5}{6})$
35.  $-\frac{1}{4} x(5-x^2)^{3/2} + \frac{5}{8} x \sqrt{5-x^2} + \frac{25}{8} \operatorname{sen}^{-1}(x/\sqrt{5}) + C$
37.  $-\frac{1}{3} \operatorname{sen}^2 x \cos^3 x - \frac{2}{15} \cos^3 x + C$
39.  $\frac{1}{10} (1+2x)^{5/2} - \frac{1}{6} (1+2x)^{3/2} + C$
41.  $-\ln(\cos x) - \frac{1}{2} \operatorname{tg}^2 x + \frac{1}{4} \operatorname{tg}^4 x + C$
43.  $\frac{2^{x-1} \sqrt{2^{2x}-1}}{\ln 2} - \frac{\ln(\sqrt{2^{2x}-1} + 2^x)}{2 \ln 2} + C$
45.  $F(x) = \frac{1}{2} \ln(x^2-x+1) - \frac{1}{2} \ln(x^2+x+1)$ ;  
 máx. em -1, mín. em 1; PI em -1,7, 0, e 1,7



47.  $F(x) = -\frac{1}{10} \operatorname{sen}^3 x \cos^7 x - \frac{3}{80} \operatorname{sen} x \cos^7 x + \frac{1}{160} \cos^5 x \operatorname{sen} x + \frac{1}{128} \cos^3 x \operatorname{sen} x + \frac{3}{256} \cos x \operatorname{sen} x + \frac{3}{256} x$



**Exercícios 7.7** □

1. (a)  $L_2 = 6, R_2 = 12, M_2 \approx 9,8$
- (b)  $L_2$  é uma subestimção;  $R_2$  e  $M_2$  são superestimadas.
- (c)  $T_2 = 9 < I$  (d)  $L_n < T_n < I < M_n < R_n$
3. (a)  $T_4 \approx 0,895759$  (subestimada)
- (b)  $M_4 \approx 0,908907$  (superestimada)
- $T_4 < I < M_4$
5. (a) 5,932957 (b) 5,869247
7. (a) 1,913972 (b) 1,934766
9. (a) 0,481672 (b) 0,481172
11. (a) 0,746211 (b) 0,747131 (c) 0,746825
13. (a) 0,451948 (b) 0,451991 (c) 0,451976
15. (a) 2,031893 (b) 2,014207 (c) 2,020651
17. (a) 0,409140 (b) 0,388849 (c) 0,395802
19. (a) 1,064275 (b) 1,067416 (c) 1,074915
21. (a)  $T_{10} \approx 0,881839, M_{10} \approx 0,882202$
- (b)  $|E_T| \leq 0,013, |E_M| \leq 0,006$
- (c)  $n = 366$  para  $T_n, n = 259$  para  $M_n$
23. (a)  $T_{10} \approx 1,719713, E_T = -0,001432$ ;  
 $S_{10} \approx 1,718283, E_S = -0,000001$
- (b)  $|E_T| \leq 0,002266, |E_S| \leq 0,0000016$
- (c)  $n = 151$  para  $T_n, n = 107$  para  $M_n, n = 8$  para  $S_n$
25. (a) 2,8 (b) 7,954926518 (c) 0,2894 (d) 7,954926521
- (e) O erro real é muito pequeno. (f) 10,9
- (g) 7,953789422 (h) 0,0592
- (i) O erro real é pequeno. (j)  $n \geq 50$



27.

$n$	$L_n$	$R_n$	$T_n$	$M_n$
4	0,140625	0,390625	0,265625	0,242188
8	0,191406	0,316406	0,253906	0,248047
16	0,219727	0,282227	0,250977	0,249512

$n$	$E_L$	$E_R$	$E_T$	$E_M$
4	0,109375	-0,140625	-0,015625	0,007813
8	0,058594	-0,066406	-0,003906	0,001953
16	0,030273	-0,032227	-0,000977	0,000488

29.

$n$	$T_n$	$M_n$	$S_n$
6	4,661488	4,669245	4,666563
12	4,665367	4,667316	4,666659

$n$	$E_T$	$E_M$	$E_S$
6	0,005179	-0,002578	0,000104
12	0,001300	-0,000649	0,000007

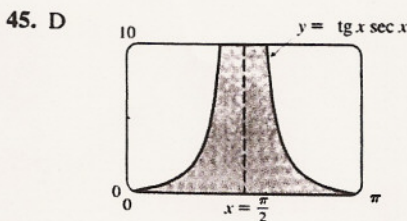
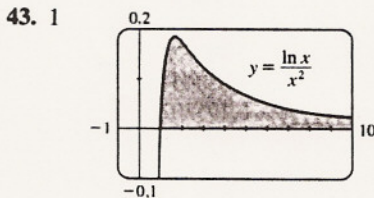
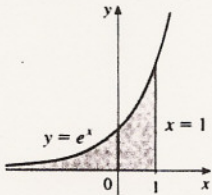
Mesmas observações dadas no Exemplo 1.

31. (a) 11,5 (b) 12 (c) 11,6 33. (a) 15,4 (b) 0,022  
 35. 37,73 pés/s 37. 34,1% 39. 12,3251 41. 59,4

**Exercícios 7.8** □

Abreviações: C = convergente; D = divergente

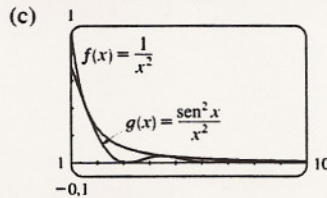
1. (a) Intervalo infinito (b) Descontinuidade infinita  
 (c) Descontinuidade infinita (d) Intervalo infinito  
 3.  $\frac{1}{2} - 1/(2r^2)$ ; 0,495, 0,49995, 0,4999995; 0,5  
 5.  $\frac{1}{12}$  7. D 9. 1 11. D 13. 0 15.  $-\ln \frac{2}{3}$   
 17. D 19.  $e^2/4$  21. D 23. D 25. 1  
 27.  $2\sqrt{3}$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



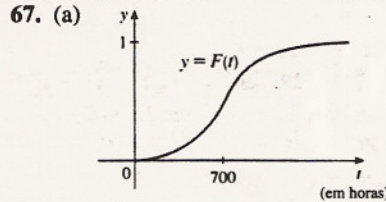
47. (a)

$t$	$\int_1^t [(\sin^2 x)/x^2] dx$
2	0,447453
5	0,577101
10	0,621306
100	0,688479
1,000	0,672957
10,000	0,673390

Mostrando que a integral é convergente.



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



- (b) A taxa na qual a fração  $F(t)$  cresce quando  $t$  cresce.  
 (c) 1; em última análise, todas as lâmpadas ficaram queimadas.  
 69. 1000  
 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.  $C = 1, \ln 2$

**Capítulo 7 Revisão** □

**Testes Falso-Verdadeiro**

1. Falso 3. Falso 5. Falso 7. Falso 9. Falso

**Exercícios**

1.  $2x - \ln|3x+2| + C$  3.  $-\cotg x - x + C$   
 5.  $\frac{1}{25}x^5(5 \ln x - 1) + C$   
 7.  $\frac{1}{9} \sec^2 x - \frac{3}{7} \sec^4 x + \frac{3}{5} \sec^6 x - \frac{1}{3} \sec^8 x + C$   
 9.  $-\frac{1}{2} \cos(x^2) + C$  11.  $\ln|x| - \frac{1}{2} \ln(x^2+1) + C$   
 13.  $\frac{1}{3} \sin^3 \theta - \frac{2}{5} \sin^5 \theta + \frac{1}{7} \sin^7 \theta + C$   
 15.  $x \sec x - \ln|\sec x + \tg x| + C$   
 17.  $\frac{1}{6} (\arctg x)^6 + C$  19.  $\ln|x-2 + \sqrt{x^2-4x}| + C$   
 21.  $-\frac{1}{12} (\cotg^2 4x + 3 \cotg 4x) + C$  23.  $\ln x [\ln(\ln x) - 1] + C$   
 25.  $\frac{3}{2} \ln(x^2+1) - 3 \tg^{-1} x + \sqrt{2} \tg^{-1}(x/\sqrt{2}) + C$   
 27.  $\frac{1}{4} \ln|(e^{2x}-1)/(e^{2x}+1)| + C$   
 29.  $(x/\sqrt{4-x^2}) - \sen^{-1}(x/2) + C$   
 31.  $\frac{1}{2} \sen 2x - \frac{1}{8} \cos 4x + C$  33.  $\frac{1}{36}$  35.  $4 \ln 4 - 8$   
 37.  $1 - (\pi/2)$  39.  $\frac{2}{3}$  41. D 43.  $8 \ln \frac{4}{3} - 1$   
 45.  $\sqrt{3} - (\pi/3)$  47.  $\frac{1}{3}$  49.  $\pi/4$



51.  $(x + 1) \ln(x^2 + 2x + 2) + 2 \operatorname{arctg}(x + 1) - 2x + C$   
 53. 0    55.  $\frac{1}{2}[e^x \sqrt{1 - e^{2x}} + \operatorname{sen}^{-1}(e^x)] + C$   
 57.  $\frac{1}{4}(2x + 1)\sqrt{x^2 + x + 1} + \frac{3}{8} \ln|x + \frac{1}{2} + \sqrt{x^2 + x + 1}| + C$   
 61. Não    63. (a) 1,090608    (b) 1,088840    (c) 1,089429  
 65. (a) 0,0067,  $n \geq 259$     (b) 0,003,  $n \geq 183$     67. 8,6 mi  
 69. (a) 3,8    (b) 1,7867, 0,000646    (c)  $n \geq 30$   
 71. C    73. 2    75.  $3\pi^2/16$

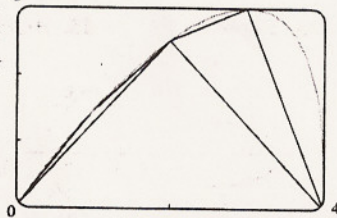
**Problemas Quentes** □

1. Em torno de 1,85 pol do centro    3. 0    5.  $f(\pi) = -\pi/2$   
 9.  $(b^b a^{-a})^{1/(b-a)} e^{-1}$

**Capítulo 8**

**Exercícios 8.1** □

1.  $3\sqrt{10}$     3.  $(13\sqrt{13} - 8)/27$     5.  $\frac{46}{3}$     7.  $\frac{4}{3}$     9.  $\frac{181}{9}$   
 11.  $\ln(\sqrt{2} + 1)$     13.  $\ln 3 - \frac{1}{2}$     15.  $\operatorname{senh} 1$   
 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.  $\int_0^{\pi/2} \sqrt{1 + e^{2x}(1 - \operatorname{sen} 2x)} dx$   
 23. 1,548    25. 3,820  
 27. (a), (b) <sup>3</sup>

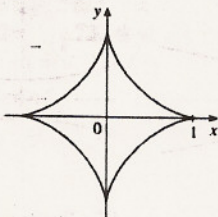


$L_1 = 4,$   
 $L_2 \approx 6,43,$   
 $L_4 \approx 7,50$

(c)  $\int_0^4 \sqrt{1 + [4(3-x)/(3(4-x)^{2/3})]^2} dx$     (d) 7,7988

29.  $\ln 3 - \frac{1}{2}$

31. 6



33.  $s(x) = \frac{2}{27}[(1 + 9x)^{3/2} - 10\sqrt{10}]$     35. 209,1 m

37. 29,36    39. 12,4

**Exercícios 8.2** □

1.  $\int_1^3 2\pi \ln x \sqrt{1 + (1/x)^2} dx$     3.  $\int_0^{\pi/4} 2\pi x \sqrt{1 + (\sec x \operatorname{tg} x)^2} dx$   
 5.  $\pi(145\sqrt{145} - 1)/27$     7.  $\pi(37\sqrt{37} - 17\sqrt{17})/6$   
 9.  $2\pi[\sqrt{2} + \ln(\sqrt{2} + 1)]$     11.  $\pi[1 + \frac{1}{4}(e^2 - e^{-2})]$   
 13.  $21\pi/2$     15.  $\pi(145\sqrt{145} - 10\sqrt{10})/27$   
 17.  $\frac{\pi}{4} \left[ 2e\sqrt{1 + 4e^2} - 2\sqrt{5} + \ln\left(\frac{2e + \sqrt{1 + 4e^2}}{2 + \sqrt{5}}\right) \right]$   
 19.  $\pi[21 - 8 \ln 2 - (\ln 2)^2]/8$     21.  $\approx 3,44$   
 23.  $(\pi/4)[4 \ln(\sqrt{17} + 4) - 4 \ln(\sqrt{2} + 1) - \sqrt{17} + 4\sqrt{2}]$

25.  $(\pi/6)[\ln(\sqrt{10} + 3) + 3\sqrt{10}]$     29.  $\pi/4$

31.  $2\pi[b^2 + a^2 b \operatorname{sen}^{-1}(\sqrt{a^2 - b^2}/a)]/\sqrt{a^2 - b^2}$

33.  $\int_a^b 2\pi[c - f(x)]\sqrt{1 + [f'(x)]^2} dx$     35.  $4\pi^2 r^2$

**Exercícios 8.3** □

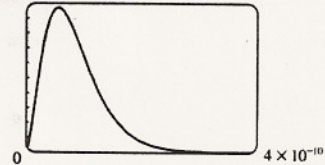
1. (a) 187,5 lb/pés<sup>2</sup>    (b) 1875 lb    (c) 562,5 lb  
 3.  $6,5 \times 10^6$  N    5.  $1,56 \times 10^3$  lb    7.  $3,47 \times 10^4$  lb  
 9.  $1000g\pi r^3$  N    11.  $5,27 \times 10^5$  N  
 13. (a) 314 N    (b) 353 N  
 15. (a)  $5,63 \times 10^3$  lb    (b)  $5,06 \times 10^4$  lb    (c)  $4,88 \times 10^4$  lb  
 (d)  $3,03 \times 10^5$  lb  
 19. 40, 12,  $(1, \frac{10}{3})$     21. (1,5, 1,2)  
 23.  $(1/(e-1), (e+1)/4)$     25.  $(\pi/4, \pi/8)$   
 27.  $(\pi\sqrt{2} - 4)/[4(\sqrt{2} - 1)], 1/[4(\sqrt{2} - 1)]$   
 29. (2, 0)    31.  $\frac{4}{3}, 0, (0, \frac{2}{3})$     33. (0,781, 1,330)    37.  $(0, \frac{1}{12})$   
 39.  $\frac{1}{3}\pi r^2 h$

**Exercícios 8.4** □

1. \$ 14.516.000    3. \$ 43.866.933,33    5. \$ 407,25  
 7. \$ 4166,67    9. 3727; \$ 37.753  
 11.  $16(2\sqrt{2} - 1)/3 \approx$  \$ 9,75 milhões    13.  $1,19 \times 10^{-4}$  cm<sup>3</sup>/s  
 15.  $\frac{1}{3}$  L/s

**Exercícios 8.5** □

1. (a)  $\int_{100}^{200} f(t) dt$  é a probabilidade de uma bateria escolhida ao acaso ter uma vida útil entre 100 e 200 horas.  
 (b)  $\int_{200}^{\infty} f(t) dt$  é a probabilidade de uma bateria escolhida ao acaso ter uma vida útil de no mínimo 200 horas.  
 3. (a)  $f(x) \geq 0$  para todo  $x$  e  $\int_{-\infty}^{\infty} f(x) dx = 1$     (b) 5  
 7. (a)  $e^{-4/2,5} \approx 0,20$     (b)  $1 - e^{-2/2,5} \approx 0,55$   
 (c) Se não for servido dentro de 10 minutos você ganha um hambúrguer.  
 9.  $\approx 44,3\%$     11.  $\approx 0,9545$   
 13. (b) 0;  $a_0$     (c)  $1 \times 10^{10}$



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

**Capítulo 8 Revisão** □

**Exercícios**

1.  $\frac{2}{3}(5\sqrt{5} - 2\sqrt{2})$     3. (a)  $\frac{17}{12}$     (b)  $\frac{47}{16}\pi$     5. 7,0826  
 7.  $56\sqrt{3}\pi^2/5$     9. 458 lb    11.  $(-\frac{1}{2}, \frac{12}{5})$     13.  $(2, \frac{2}{3})$   
 15.  $2\pi^2$     17. \$ 7.166,67    19. (b) 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** □

1.  $2\pi/3 - \sqrt{3}/2$   
 3. (a)  $2\pi r(r \pm d)$     (b)  $\approx 3.360.000$  mi<sup>2</sup>  
 (d)  $\approx 78.400.000$  mi<sup>2</sup>