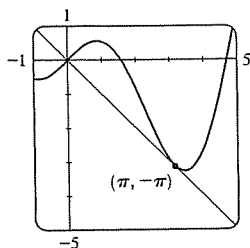


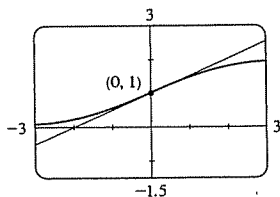
9. $(x \sec^2 x - \tan x)/x^2$
 11. $(\sin x + \cos x + x \sin x - x \cos x)/(1 + \sin 2x)$
 13. $(x \cos x - 2 \sin x)/x^3$ 15. $-\csc x \cot^2 x - \csc^3 x$
 21. $y = 2x + 1 - \pi/2$ 23. $y = x + 1$
 25. (a) $y = -x$
 (b)



27. (a) $2 - \csc^2 x$ 29. $(2n + 1)\pi \pm \pi/3, n$ an integer
 31. (a) $8 \cos t$ (b) $4\sqrt{3}, -4$; to the left 33. 5 ft/rad
 35. 5 37. $\sin 1$ 39. 0 41. $\frac{1}{2}$ 43. $\frac{1}{2}$
 45. (a) $\sec^2 x = 1/\cos^2 x$ (b) $\sec x \tan x = (\sin x)/\cos^2 x$
 (c) $\cos x - \sin x = (\cot x - 1)/\csc x$ 47. 1

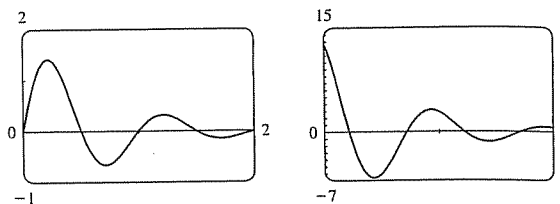
Exercises 3.5 □ page 221

1. $10(x^2 + 4x + 6)^4(x + 2)$
 3. $-\sin(\tan x) \sec^2 x$ 5. $e^{\sqrt{x}}/(2\sqrt{x})$
 7. $F'(x) = 7(x^3 + 4x)^6(3x^2 + 4)$ [or $7x^6(x^2 + 4)^6(3x^2 + 4)$]
 9. $g'(x) = (2x - 7)/(2\sqrt{x^2 - 7x})$
 11. $h'(t) = \frac{3}{2}(t - 1/t)^{1/2}(1 + 1/t^2)$
 13. $y' = -3x^2 \sin(a^3 + x^3)$ 15. $y' = -me^{-mx}$
 17. $G'(x) = 6(3x - 2)^9(5x^2 - x + 1)^{11}(85x^2 - 51x + 9)$
 19. $y' = 8(2x - 5)^3(8x^2 - 5)^{-4}(-4x^2 + 30x - 5)$
 21. $y' = e^{-x^2}(1 - 2x^2)$ 23. $F'(y) = 39(y - 6)^2/(y + 7)^4$
 25. $f'(z) = -\frac{2}{3}(2z - 1)^{-6/5}$ 27. $y' = -\sin x \sec^2(\cos x)$
 29. $y' = 5^{-1/x}(\ln 5)/x^2$ 31. $y' = 3 \sin x \cos x (\sin x - \cos x)$
 33. $y' = -12 \cos x \sin x (1 + \cos^2 x)^5$
 35. $y' = (3e^{3x} + 2e^{4x})/(1 + e^x)^2$
 37. $y' = (\cos x - x \sin x)e^{x \cos x}$
 39. $y' = [1 + 1/(2\sqrt{x})]/(2\sqrt{x} + \sqrt{x})$
 41. $y' = \cos(\tan \sqrt{\sin x})(\sec^2 \sqrt{\sin x})[1/(2\sqrt{\sin x})](\cos x)$
 43. $y = -\frac{3}{16}x + \frac{11}{4}$ 45. $y = -x + \pi$
 47. (a) $y = \frac{1}{2}x + 1$
 (b)



49. (a) $-1/(x^2\sqrt{1-x^2})$
 51. $((\pi/2) + 2n\pi, 3), ((3\pi/2) + 2n\pi, -1), n$ an integer
 53. 28 55. (a) 30 (b) 36
 57. (a) $\frac{3}{4}$ (b) Does not exist (c) -2 59. -17.4
 61. (a) $F'(x) = e^x f'(e^x)$ (b) $G'(x) = e^{f(x)} f'(x)$
 63. $v(t) = (5\pi/2) \cos(10\pi t)$ cm/s
 65. (a) $dB/dt = (7\pi/54) \cos(2\pi t/5.4)$ (b) 0.16

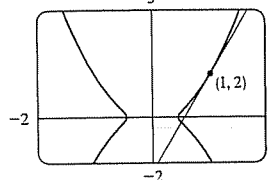
67. $v(t) = 2e^{-1.5t}(2\pi \cos 2\pi t - 1.5 \sin 2\pi t)$



69. (a) $y \approx 100.012437e^{-10.005531t}$ (b) $-670.625828 \mu A$
 71. (b) The factored form 75. (b) $-n \cos^{n-1} x \sin[(n + 1)x]$

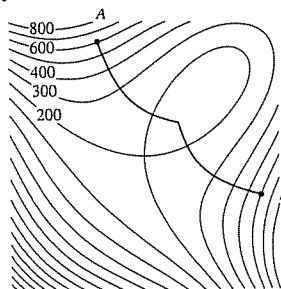
Exercises 3.6 □ page 230

1. (a) $y' = -(y + 2 + 6x)/x$
 (b) $y = (4/x) - 2 - 3x, y' = -(4/x^2) - 3$
 3. (a) $y' = -y^2/x^2$ (b) $y = x/(x - 1), y' = -1/(x - 1)^2$
 5. $y' = -x/y$ 7. $y' = -x(3x + 2y)/(x^2 + 8y)$
 9. $y' = (3 - 2xy - y^2)/(x^2 + 2xy)$
 11. $y' = (y/x) + 2(x - y)^2$ [or $(3x^2 + 1 - 2xy)/(x^2 + 2)$]
 13. $y' = (4xy\sqrt{xy} - y)/(x - 2x^2\sqrt{xy})$
 15. $y' = \tan x \tan y$ 17. $y' = 1 + [e^x(1 + x)]/\sin(x - y)$
 19. $y' = -y/x$ 21. $-\frac{1}{6}$
 23. $dx/dy = (1 - 4y^3 - 2x^2y - x^4)/(2xy^2 + 4yx^3)$
 25. $y = -\frac{5}{4}x - 4$ 27. $y = x$ 29. $y = -\frac{9}{13}x + \frac{40}{13}$
 31. (a) $y = \frac{9}{2}x - \frac{5}{2}$ (b)

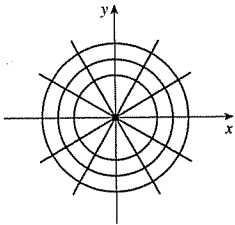


33. (a) Eight; $x \approx 0.42, 1.58$
 (b) $y = -x + 1,$
 $y = \frac{1}{3}x + 2$
 (c) $1 \mp \sqrt{3}/3$

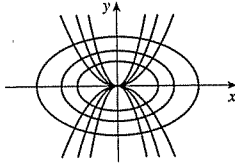
35. $(\pm 5\sqrt{3}/4, \pm 5/4)$ 37. $(x_0/a^2) - (y_0/b^2) = 1$
 41. $y' = 2x/\sqrt{1-x^4}$ 43. $y' = e^x/(1 + e^{2x})$
 45. $H'(x) = 1 + 2x \arctan x$ 47. $g'(t) = -4/\sqrt{t^4 - 16t^2}$
 49. $y' = 2x \cot^{-1}(3x) - 3x^2/(1 + 9x^2)$
 51. $f'(x) = e^x - x^2/(1 + x^2) - 2x \arctan x$
 57.



59.



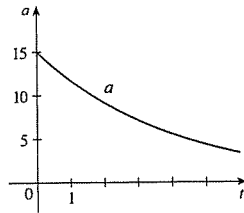
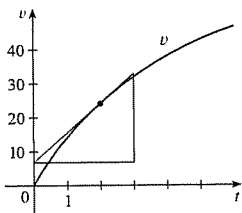
61.



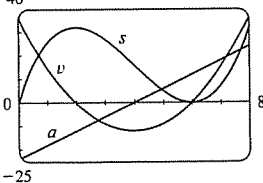
63. $(\pm\sqrt{3}, 0)$ 65. $(-1, -1), (1, 1)$ 67. $(b)^{\frac{3}{2}}$ 69. 2

Exercises 3.7 □ page 237

1. $a = f, b = f', c = f''$
3. $a = \text{acceleration}, b = \text{velocity}, c = \text{position}$
5. $f'(x) = 5x^4 + 12x - 7, f''(x) = 20x^3 + 12$
7. $y' = -2 \sin 2\theta, y'' = -4 \cos 2\theta$
9. $h'(x) = x/\sqrt{x^2 + 1}, h''(x) = 1/(x^2 + 1)^{3/2}$
11. $F'(s) = 24(3s + 5)^7, F''(s) = 504(3s + 5)^6$
13. $y' = 1/(1 - x)^2, y'' = 2/(1 - x)^3$
15. $y' = -\frac{3}{2}x(1 - x^2)^{-1/4}, y'' = \frac{3}{4}(1 - x^2)^{-5/4}(x^2 - 2)$
17. $H'(t) = 3 \sec^2 3t, H''(t) = 18 \sec^2 3t \tan 3t$
19. $g'(t) = t^2 e^{5t}(5t + 3), g''(t) = te^{5t}(25t^2 + 30t + 6)$
21. (a) $f'(x) = 2 \sin x (\cos x - 1) = \sin 2x - 2 \sin x, f''(x) = 2(\cos 2x - \cos x)$
23. $3(2x + 3)^{-5/2}$
25. $1/\sqrt{2}, 3/(4\sqrt{2}), 27/(16\sqrt{2}), 405/(64\sqrt{2})$ 27. -80
29. $-2x/y^5$ 31. $-6/(x + 2y)^3$ 33. $n!$ 35. $2^n e^{2x}$
37. $(-1)^n(n + 2)!/(6x^{n+3})$ 39. $-2^{50} \cos 2x$
41. 9 ft/s^2



43. (a) $v(t) = 3t^2 - 3, a(t) = 6t$ (b) 6 m/s^2
(c) $a(1) = 6 \text{ m/s}^2$
45. (a) $v(t) = 2\pi \cos 2\pi t, a(t) = -4\pi^2 \sin 2\pi t$
(b) 0 m/s^2 (c) $4\pi^2 \text{ m/s}^2$
47. (a) $t = 0, 2$ (b) $s(0) = 2 \text{ m}, v(0) = 0 \text{ m/s}; s(2) = -14 \text{ m}, v(2) = -16 \text{ m/s}$
49. (a) $6t - 24; -6 \text{ m/s}^2$ (b) 40



- (c) Speeding up when $2 < t < 4$ or $t > 6$; slowing down when $0 \leq t < 2$ or $4 < t < 6$
51. (a) $v(t) = A\omega \cos \omega t, a(t) = -A\omega^2 \sin \omega t$
53. $P(x) = x^2 - x + 3$ 55. $A = -\frac{3}{10}, B = -\frac{1}{10}$
57. $r = 1, -6$ 59. $f''(x) = 6xg'(x^2) + 4x^3g''(x^2)$
61. $f''(x) = [\sqrt{x}g''(\sqrt{x}) - g'(\sqrt{x})]/(4x\sqrt{x})$
63. (a) $f'(x) = -(2x + 1)/(x^2 + x)^2, f''(x) = 2(3x^2 + 3x + 1)/(x^2 + x)^3$

$$f'''(x) = -6(4x^3 + 6x^2 + 4x + 1)/(x^2 + x)^4,$$

$$f^{(4)}(x) = 24(5x^4 + 10x^3 + 10x^2 + 5x + 1)/(x^2 + x)^5$$

$$(b) f^{(n)}(x) = (-1)^n n! [x^{-(n+1)} - (x + 1)^{-(n+1)}]$$

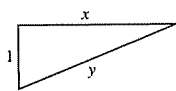
Exercises 3.8 □ page 245

1. The differentiation formula is simplest.
3. $f'(\theta) = -\tan \theta$ 5. $f'(x) = 2x/[(x^2 - 4) \ln 3]$
7. $F'(x) = 1/(2x)$ 9. $f'(x) = (2 + \ln x)/(2\sqrt{x})$
11. $g'(x) = -2a/(a^2 - x^2)$ 13. $F'(x) = e^x(\ln x + 1/x)$
15. $y' = (1 + x - x \ln x)/(x(1 + x)^2)$
17. $y' = (3x - 2)/[x(x - 1)]$ 19. $y' = -x/(1 + x)$
21. $y' = 1 + \ln x, y'' = 1/x$
23. $y' = 1/(x \ln 10), y'' = -1/(x^2 \ln 10)$
25. $f'(x) = 2/(2x + 1); (-\frac{1}{2}, \infty)$
27. $f'(x) = 2x \ln(1 - x^2) - 2x^3/(1 - x^2), (-1, 1)$ 29. 0
31. $x - ey = e$ 33. $f'(x) = \cos x + 1/x$
35. $y' = (2x + 1)^5(x^4 - 3)^6 \left(\frac{10}{2x + 1} + \frac{24x^3}{x^4 - 3} \right)$
37. $y' = \frac{\sin^2 x \tan^4 x}{(x^2 + 1)^2} \left(2 \cot x + \frac{4 \sec^2 x}{\tan x} - \frac{4x}{x^2 + 1} \right)$
39. $y' = x^x(\ln x + 1)$ 41. $y' = x^{\sin x}[\cos x \ln x + (\sin x)/x]$
43. $y' = (\ln x)^x(\ln \ln x + 1/\ln x)$ 45. $e^x x e^x (\ln x + 1/x)$
47. $y' = 2x/(x^2 + y^2 - 2y)$
49. $f^{(n)}(x) = (-1)^{n-1}(n - 1)!/(x - 1)^n$

Exercises 3.9 □ page 251

1. (a) 0 (b) 1 3. (a) $\frac{3}{4}$ (b) $\frac{1}{2}(e^2 - e^{-2}) \approx 3.62686$
5. (a) 1 (b) 0
21. $\coth x = \frac{5}{4}, \operatorname{sech} x = \frac{3}{5}, \cosh x = \frac{5}{3}, \sinh x = \frac{4}{3}, \operatorname{csch} x = \frac{3}{4}$
23. (a) 1 (b) -1 (c) ∞ (d) $-\infty$ (e) 0 (f) 1
(g) ∞ (h) $-\infty$ (i) 0
31. $x \sinh x + \cosh x$ 33. $2x \cosh(x^2)$
35. $-(2 \sinh x)/(1 + \cosh x)^2$
37. $-(t \operatorname{csch}^2 \sqrt{1 + t^2})/\sqrt{1 + t^2}$ 39. $e^t \operatorname{sech}^2(e^t)$
41. $3e^{\cosh 3x} \sinh 3x$ 43. $1/[2\sqrt{x}(1 - x)]$
45. $\sinh^{-1}(x/3)$ 47. $-1/(x\sqrt{x^2 + 1})$
49. (a) 0.3572 (b) 70.34°
51. (b) $y = 2 \sinh 3x - 4 \cosh 3x$ 53. $(\ln(1 + \sqrt{2}), \sqrt{2})$

Exercises 3.10 □ page 257

1. $dV/dt = 3x^2 dx/dt$ 3. 70
5. (a) The plane's altitude is 1 mi and its velocity is 500 mi/h.
(b) The rate at which the distance from the plane to the station is increasing when the plane is 2 mi from the station
- (c) 
- (d) $y^2 = x^2 + 1$ (e) $250\sqrt{3} \text{ mi/h}$
7. (a) The height of the pole (15 ft), the height of the man (6 ft), and the speed of the man (5 ft/s)
(b) The rate at which the tip of his shadow is moving when he is 40 ft from the pole.