

Answers to Even-Numbered Exercises

Exercises 3.1

2. A and B

4. A, B, D, C

6. B and D

10. (a) $x = 1.5$

(b) $x = -1$

18. $x = \pm \frac{1}{2}$

22. $x = \frac{1}{4}$

28. $6x^2$

34. (a) $-2t$

(b) At $t = 4$, slope is -8 . Therefore, sales are decreasing.

(c) $t = 14.5$

Exercises 3.2

2. $\frac{-2}{(2x+1)^2}$

10. $\frac{3}{2}x^{1/2}$

16. $f'(0.6) \approx -0.2$

$f'(0.8) \approx -0.9$ (or -0.6)

$f'(1) \approx -1.4$ (or -1.3)

18. At $x = -1$, slope is 5.

30. $f'(x) = 3x^2 - 10x + 4$

36. $4x^3 - 6/x^3$

40. $y = -2x$

52. forward difference formula: $f'(0) \approx -2.9$

backward difference formula: $f'(0) \approx -3.1$

central difference formula: $f'(0) \approx -3$

forward difference formula: $f'(0.2) \approx -2.5$

backward difference formula: $f'(0.2) \approx -2.7$

central difference formula: $f'(0.2) \approx -2.6$

forward difference formula: $f'(-0.1) \approx -3.1$
backward difference formula: $f'(-0.1) \approx -3.3$
central difference formula: $f'(-0.1) \approx -3.2$

Exercises 3.3

6. (a) $v = 8 - 1.66t$ m/sec
(b) up; down
(c) -1.66; -1.66
10. (a) -32 feet/sec
(b) -32 feet/sec
(c) -32 feet/sec
12. (a) $v(0) = 4$, $v(1) = 1$
(b) average velocity = 3
(c) $a(1) = -5.5$
(d) at time $t=1$: moving right, velocity decreasing, speed decreasing
16. c
24. $f''(t) = 12t^2 - \frac{3}{2}t - \frac{2}{3}$
30. $f''(4) = 3/8$
36. $h'''(x) = 24x - \frac{21}{64}x - \frac{11}{4}$
38. (a) $MP(x) = 450 - 2x$
(b) They should increase production, because $MP(160) = 130 > 0$
(c) They should increase production, because $MP(200) = 50 > 0$
They should decrease production, because $MP(160) = -30 < 0$
40. (a) $f'(t)$ is negative
(b) $f'(6) = -9$
(c) $f(12) = 192$; $f'(12) = -8$
44. (a) $P_A(t) = 2P_B(t)$
(b) $P'_B(t) = 2P'_A(t)$
(c) $P'_A(t) = cP_A(t)$, for some constant c

Exercises 3.4

4. (b) $f(50) \approx 97/686$
(c) $f(3.9) \approx 0.50625$

6. (b) $f(10.03) \approx 0.0997$

16. $f(1.01) \approx 0.505$

$f(1.1) \approx 0.55$

more accurate for $f(1.01)$; smaller than the actual values

20. $C(102) \approx 2524$

26. $s(4.02) \approx -2.88$

38. $f(x)$ is not differentiable at $x = 0$ because $f'(0) = \lim_{h \rightarrow 0} h^{-1/3}$ does not exist; however, $f(x)$ is continuous at $x = 0$.

46.

$$f(x) = \begin{cases} 0.15x & \text{for } 0 < x \leq 25350 \\ 0.28x - 3295.50 & \text{for } 25350 < x \leq 61400 \\ 0.31x - 5137.50 & \text{for } 61400 < x \leq 128100 \\ 0.36x - 11542.50 & \text{for } 128100 < x \leq 278450 \\ 0.396x - 21566.70 & \text{for } x > 278450 \end{cases}$$

Exercises 3.5

4. $\frac{2x+1}{x^2}$

8. $y = x - 1$

12. $x = 3$

28. $e^t - \frac{1}{t^2} - \frac{2}{t^3}$

34. $(-1, 0)$

58. (a) $H(0) = 4.5$

(b) $H'(0) = 0.07$; $H'(28) \approx 0.026$

(c) $\lim_{t \rightarrow \infty} H(t) = 6.5$

62. $H(t) = 65 + 25e^{0.6}e^{-0.12t}$

66. 3940

Exercises 3.6

6. $\frac{3}{2}x^{1/2} + (x^{1/2})/(2x^2)$

16. -10

20. $y = \frac{x}{5} + \frac{4}{5}$

26. $x = e$

28. (a) $R'(100) = 8000$

(b) They should increase the price (since $R'(100) > 0$).

30. $G'(w) = 0.12(1 + 0.001w)e^{0.001w}$

32. (a) $MP = 0.12(1 + 0.001w)e^{0.001w} - \frac{0.15w^2 + 9w}{(9 + 0.3w)^2}$

(b) $MP(200) = -1.47$, $MP(300) = -1.44$. In both cases, he/she should go after lighter prey.

Exercises 3.7

10. $y = e^{-x^2}$
 $\frac{dy}{dx} = -2xe^{-x^2}$

18. $12(3x^2 - 6x + 2)(x^3 - 3x^2 + 2x - 1)^{11}$

26. $y = 3x - 1$

32. $x = 1$

38. $2/3$

44. $-1/2$

52. (a) $(1000 - 40t^2)e^{-0.02t^2}$

(b) $R'(8) = -62507$

Exercises 3.8

6. $y' = 2e^{2x}$

10. $y' = \frac{-ye^x - 2e^{2x}}{2y + e^x}$

22. $\frac{dh}{dt} = \frac{1}{9\pi} \approx 0.0354$

30. (a) $\frac{dS}{dt} = \frac{2k}{3}(V^{-1/3}) \cdot \frac{dV}{dt}$

(b) $S = k(270^{2/3}) \approx 202 \text{ in}^2$

$\frac{dS}{dt} = 12k(270^{-1/3}) \approx 8.98 \text{ in}^2/\text{sec}$