

Solutions Manual for Finite Mathematics 12th Lial

SOLUTIONS MANUAL SAMPLE PREVIEW

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RESOURCE TYPE

Solutions Manual

Complete Instructor Answers

Answers to selected writing exercises are provided.

Answers to Prerequisite Skills Diagnostic Test

1. 20% 2. $51/35$ 3. $x + y = 75$ 4. $s \geq 4p$ 5. $-20/3$ (Sec. R.4) 6. $-11/5$ (Sec. R.4)
7. $(-2, 5]$ (Sec. R.5) 8. $x \leq -3$ (Sec. R.5) 9. $y \geq -17/2$ (Sec. R.5) 10. $p > 3/2$ (Sec. R.5)

Chapter R Algebra Reference

Exercises R.1 (page R-5–R-6)

For exercises . . .	1–8	9, 10	11–16	17–24	25–28
Refer to example . . .	2	3	4	5	6

1. $-x^2 + x + 9$ 2. $-6y^2 + 3y + 10$ 3. $(3/2)z^2 + (5/6)z + 2$
4. $(1/2)t^2 + (1/2)t + 2/3$ 5. $-16q^2 + 4q + 6$ 6. $9r^2 - 4r + 19$ 7. $-0.327x^2 - 2.805x - 1.458$
8. $0.8r^2 + 3.6r - 1.5$ 9. $-18m^3 - 27m^2 + 9m$ 10. $-12x^4 + 30x^2 + 36x$ 11. $9t^2 + 9ty - 10y^2$
12. $18k^2 - 7kq - q^2$ 13. $4 - 9x^2$ 14. $36m^2 - 25$ 15. $(6/25)y^2 + (11/40)yz + (1/16)z^2$
16. $(15/16)r^2 - (7/12)rs - (2/9)s^2$ 17. $27p^3 - 1$ 18. $15p^3 + 13p^2 - 10p - 8$ 19. $8m^3 + 1$
20. $12k^4 + 21k^3 - 5k^2 + 3k + 2$ 21. $3x^2 + xy + 2xz - 2y^2 - 3yz - z^2$ 22. $2r^2 + 2rs - 5rt - 4s^2 + 8st - 3t^2$
23. $x^3 + 6x^2 + 11x + 6$ 24. $x^3 - 2x^2 - 5x + 6$ 25. $x^2 + 4x + 4$ 26. $4a^2 - 16ab + 16b^2$
27. $x^3 - 6x^2y + 12xy^2 - 8y^3$ 28. $27x^3 + 27x^2y + 9xy^2 + y^3$

Exercises R.2 (page R-9)

For exercises . . .	1–4	5–15	16–20	21–32
Refer to example . . .	1	2, 3	3, 2nd CAUTION	4

1. $7a^2(a + 2)$ 2. $3y(y^2 + 8y + 3)$ 3. $13p^2q(p^2q - 3p + 2q)$
4. $10m^2(6m^2 - 12mn + 5n^2)$ 5. $(m + 2)(m - 7)$ 6. $(x + 5)(x - 1)$ 7. $(z + 4)(z + 5)$ 8. $(b - 7)(b - 1)$
9. $(a - 5b)(a - b)$ 10. $(s - 5t)(s + 7t)$ 11. $(y - 7z)(y + 3z)$ 12. $(3x + 7)(x - 1)$ 13. $(3a + 7)(a + 1)$
14. $(5y + 2)(3y - 1)$ 15. $(7m + 2n)(3m + n)$ 16. $6(a - 10)(a + 2)$ 17. $3m(m + 3)(m + 1)$ 18. $2(2a + 3)(a + 1)$
19. $2a^2(4a - b)(3a + 2b)$ 20. $12x^2(x - y)(2x + 5y)$ 21. $(x + 8)(x - 8)$ 22. $(3m + 5)(3m - 5)$
23. $10(x + 4)(x - 4)$ 24. Prime 25. $(z + 7y)^2$ 26. $(s - 5t)^2$ 27. $(3p - 4)^2$ 28. $(a - 6)(a^2 + 6a + 36)$
29. $(3r - 4s)(9r^2 + 12rs + 16s^2)$ 30. $3(m + 5)(m^2 - 5m + 25)$ 31. $(x - y)(x + y)(x^2 + y^2)$
32. $(2a - 3b)(2a + 3b)(4a^2 + 9b^2)$

Exercises R.3 (page R-12)

For exercises . . .	1–12	13–38
Refer to example . . .	1	2

1. $v/7$ 2. $5p/2$ 3. $8/9$ 4. $2/(t + 2)$ 5. $x - 2$ 6. $4(y + 2)$ 7. $(m - 2)/(m + 3)$
8. $(r + 2)/(r + 4)$ 9. $3(x - 1)/(x - 2)$ 10. $(z - 3)/(z + 2)$ 11. $(m^2 + 4)/4$ 12. $(2y + 1)/(y + 1)$ 13. $3k/5$
14. $25p^2/9$ 15. $9/(5c)$ 16. 2 17. $1/4$ 18. $3/10$ 19. $2(a + 4)/(a - 3)$ 20. $2/(r + 2)$ 21. $(k - 2)/(k + 3)$
22. $(m + 6)/(m + 3)$ 23. $(m - 3)/(2m - 3)$ 24. $2(2n - 1)/(3n - 5)$ 25. 1 26. $(6 + p)/(2p)$
27. $(12 - 15y)/(10y)$ 28. $137/(30m)$ 29. $(3m - 2)/[m(m - 1)]$ 30. $(r - 6)/[r(2r + 3)]$ 31. $14/[3(a - 1)]$
32. $23/[20(k - 2)]$ 33. $(7x + 1)/[(x - 2)(x + 3)(x + 1)]$ 34. $(y^2 + 1)/[(y + 3)(y + 1)(y - 1)]$
35. $k(k - 13)/[(2k - 1)(k + 2)(k - 3)]$ 36. $m(3m - 19)/[(3m - 2)(m + 3)(m - 4)]$ 37. $(4a + 1)/[a(a + 2)]$
38. $(5x^2 + 4x - 4)/[x(x - 1)(x + 1)]$

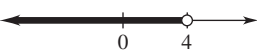
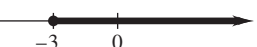
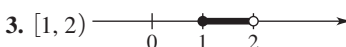
Exercises R.4 (page R-17)

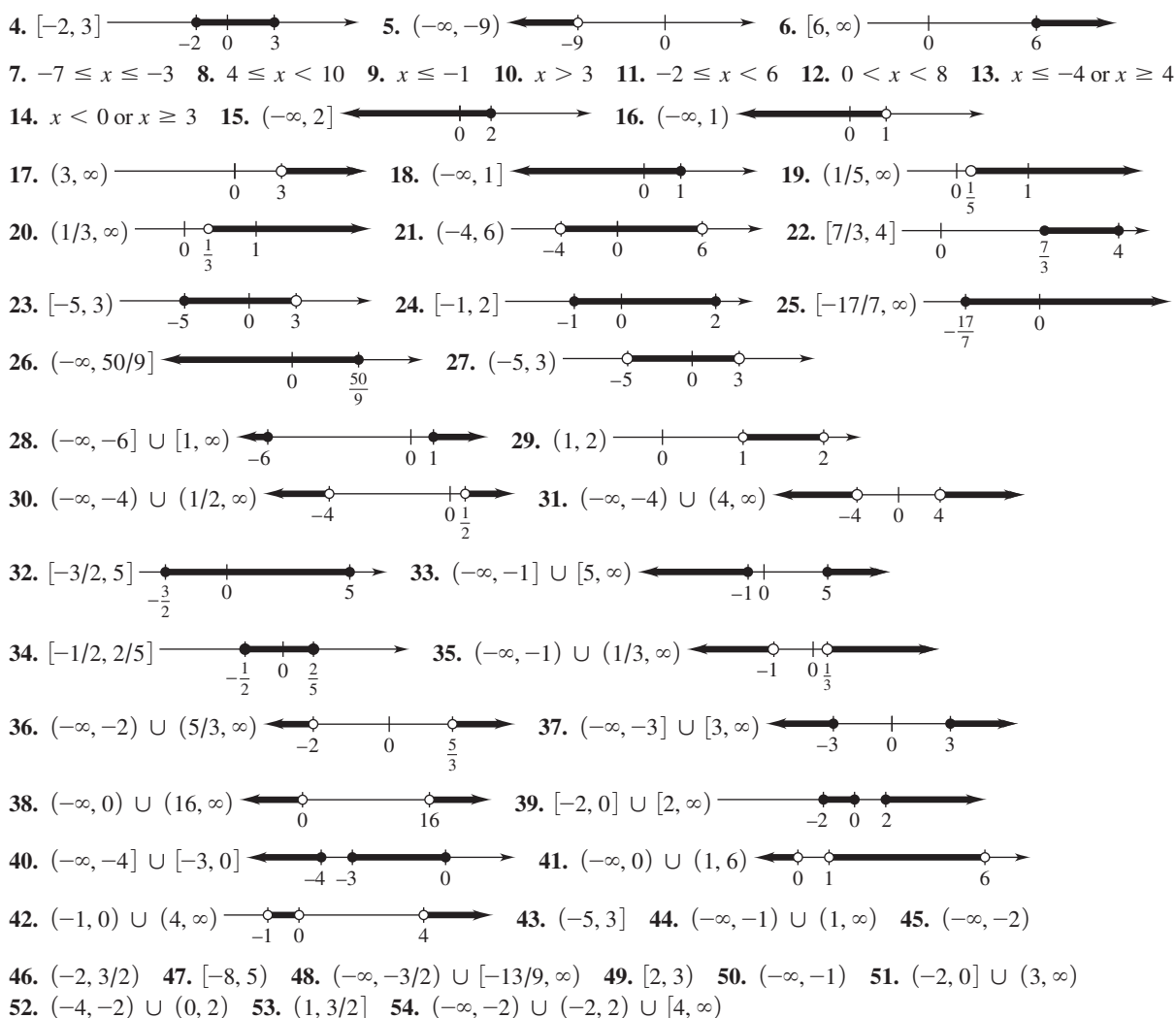
For exercises . . .	1–8	9–26	27–37
Refer to example . . .	2	3–5	6, 7

1. -12 2. $3/4$ 3. 12 4. $-3/8$ 5. $-7/8$ 6. $-6/11$ 7. 4 8. $-10/19$ 9. $-3, -2$
10. $-1, 3$ 11. 7 12. $-2, 5/2$ 13. $-1/4, 2/3$ 14. 2, 5 15. $-3, 3$ 16. $-4, 1/2$ 17. 0, 4
18. $(5 + \sqrt{13})/6 \approx 1.434, (5 - \sqrt{13})/6 \approx 0.232$ 19. $(2 + \sqrt{10})/2 \approx 2.581, (2 - \sqrt{10})/2 \approx -0.581$
20. $(-1 + \sqrt{5})/2 \approx 0.618, (-1 - \sqrt{5})/2 \approx -1.618$ 21. $5 + \sqrt{5} \approx 7.236, 5 - \sqrt{5} \approx 2.764$
22. $(4 + \sqrt{6})/5 \approx 1.290, (4 - \sqrt{6})/5 \approx 0.310$ 23. $1, 5/2$ 24. No real number solutions
25. $(-1 + \sqrt{73})/6 \approx 1.257, (-1 - \sqrt{73})/6 \approx -1.591$ 26. $-1, 0$ 27. 3 28. 12 29. $-59/6$ 30. 6 31. 3 32. $-5/2$
33. $2/3$ 34. 1 35. 2 36. No solution 37. No solution

Exercises R.5 (page R-22)

For exercises . . .	1–14	15–26	27–38	39–42	43–54
Refer to example . . .	Figure 1, Example 2	2	3	4	5–7

1. $(-\infty, 4)$ 
2. $[-3, \infty)$ 
3. $[1, 2)$ 



Exercises R.6 (page R-26)

For exercises ...	1-8	9-26	27-36	37-50	51-56
Refer to example ...	1	2	3,4	5	6

1. $1/64$ 2. $1/81$ 3. 1 4. 1 5. $-1/9$ 6. $1/9$ 7. 36 8. $27/64$
9. $1/64$ 10. 8^5 11. $1/10^8$ 12. 7 13. x^2 14. 1 15. $8k^3$ 16. $1/(3z^7)$ 17. $x^5/(3y^3)$ 18. $m^3/5^4$ 19. a^3b^6
20. $49/(c^6d^4)$ 21. $(a+b)/(ab)$ 22. $(1-ab^2)/b^2$ 23. $2(m-n)[mn(m+n^2)]$ 24. $(3n^2+4m)/(mn^2)$
25. $xy/(y-x)$ 26. $y^4/(xy-1)^2$ 27. 11 28. 3 29. 4 30. -25 31. $1/2$ 32. $4/3$ 33. $1/16$ 34. $1/5$ 35. $4/3$
36. $1000/1331$ 37. 9 38. 3 39. 64 40. 1 41. x^4/y^4 42. b/a^3 43. r 44. $12^3/y^8$ 45. $3k^{3/2}/8$ 46. $1/(2p^2)$
47. $a^{2/3}b^2$ 48. $y^2/(x^{1/6}z^{5/4})$ 49. $h^{1/3}t^{1/5}/k^{2/5}$ 50. m^3p/n 51. $3x(x^2+3x)^2(x^2-5)$ 52. $6x(x^3+7)(-2x^3-5x+7)$
53. $5x(x^2-1)^{-1/2}(x^2+1)$ 54. $3(6x+2)^{-1/2}(27x+5)$ 55. $(2x+5)(x^2-4)^{-1/2}(4x^2+5x-8)$
56. $(4x^2+1)(2x-1)^{-1/2}(36x^2-16x+1)$

Exercises R.7 (page R-30)

For exercises ...	1-22	23-26	27-40	41-44
Refer to example ...	1,2	3	4	5

1. 5 2. 6 3. -5 4. $5\sqrt{2}$ 5. $20\sqrt{5}$ 6. $4y^2\sqrt{2y}$ 7. 9 8. 8
9. $7\sqrt{2}$ 10. $9\sqrt{3}$ 11. $9\sqrt{7}$ 12. $-2\sqrt{7}$ 13. $5\sqrt[3]{2}$ 14. $3\sqrt[3]{5}$ 15. $xyz^2\sqrt{2x}$ 16. $4r^3s^4t^6\sqrt{10rs}$ 17. $4xy^2z^3\sqrt[3]{2y^2}$
18. $x^2yz^2\sqrt[4]{y^3z^3}$ 19. $ab\sqrt{ab(b-2a^2+b^3)}$ 20. $p^2\sqrt{pq(pq-q^4+p^2)}$ 21. $\sqrt[6]{a^5}$ 22. $b^2\sqrt[4]{b}$ 23. $|4-x|$
24. $|3y+5|$ 25. Cannot be simplified 26. Cannot be simplified 27. $5\sqrt{7}/7$ 28. $\sqrt{10}/2$ 29. $-\sqrt{3}/2$ 30. $\sqrt{2}$
31. $-3(1+\sqrt{2})$ 32. $-5(2+\sqrt{6})/2$ 33. $3(2-\sqrt{2})$ 34. $(5-\sqrt{10})/3$ 35. $(\sqrt{r}+\sqrt{3})/(r-3)$
36. $5(\sqrt{m}+\sqrt{5})/(m-5)$ 37. $\sqrt{y}+\sqrt{5}$ 38. $(z+\sqrt{5z}-\sqrt{z}-\sqrt{5})/(z-5)$ 39. $-2x-2\sqrt{x(x+1)}-1$
40. $[p^2+p+2\sqrt{p(p^2-1)}-1]/(-p^2+p+1)$ 41. $-1/[2(1-\sqrt{2})]$ 42. $1/(3+\sqrt{3})$
43. $-1/[2x-2\sqrt{x(x+1)}+1]$ 44. $2/[p+\sqrt{p(p-2)}]$

Chapter 1 Linear Functions

Exercises 1.1 (page 13–17)

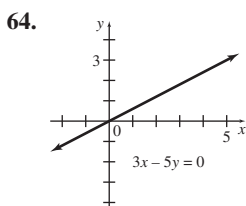
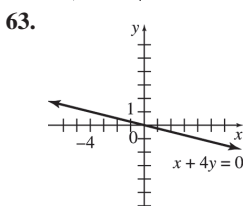
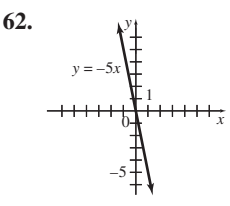
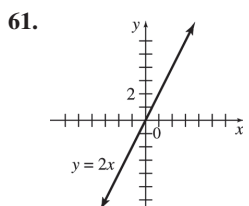
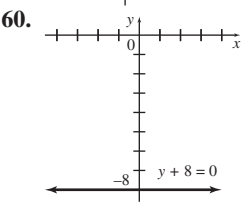
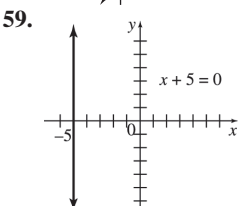
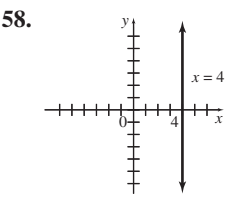
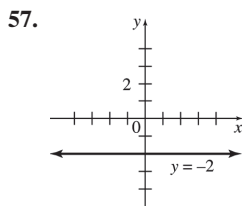
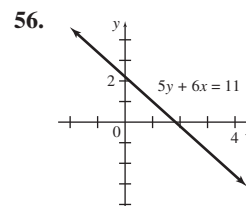
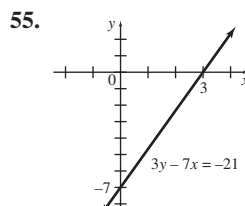
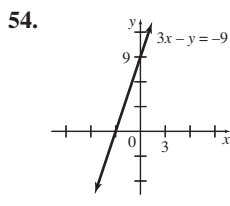
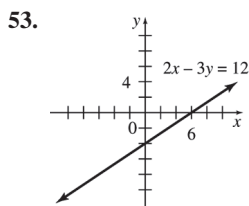
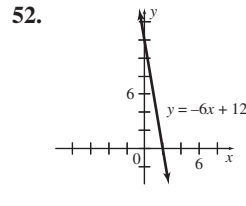
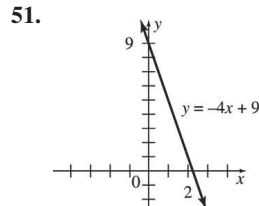
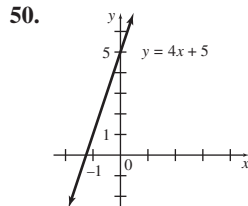
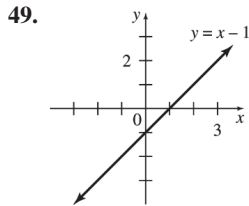
For exercises . . .	5–8	9–12	17,33,34	18,35–38	19–21	22,31	23–28	29,30	32	49–64	65–79
Refer to example . . .	1	3	8	9	4	7	5	2	6	11,12	10,13

W1. -3 W2. $y = -2x - 13$

W3. $y = (2/5)x + 19/30$

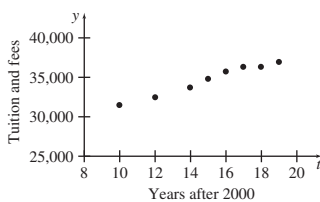
W4. $y = (2/3)x - 7/3$

1. False 2. True 3. False 4. False 5. $3/5$ 6. $-7/4$ 7. Not defined 8. 0 9. 1 10. 3 11. $5/9$ 12. $-4/7$
 13. Not defined 14. 0 15. 0 16. 0 17. 2 18. $-1/4$ 19. $y = -2x + 5$ 20. $y = -x + 6$ 21. $y = -7$ 22. $x = -8$
 23. $y = -(1/3)x + 10/3$ 24. $y = -x + 7$ 25. $y = 6x - 7/2$ 26. $y = (21/32)x + 33/16$ 27. $x = -8$ 28. $y = 3$
 29. $x + 2y = -6$ 30. $2x - y = -4$ 31. $x = -6$ 32. $y = 7$ 33. $3x + 2y = 0$ 34. $2x - y = 9$ 35. $x - y = 7$
 36. $3x + 2y = 6$ 37. $5x - y = -4$ 38. $3x + 6y = -2$ 39. No 40. (a) $k = -1/2$ (b) $k = -7/2$ 43. (a) 44. (f)
 45. -4 46. $1/2$ 48. (a) $y = -(b/a)x + b$ (b) a and b



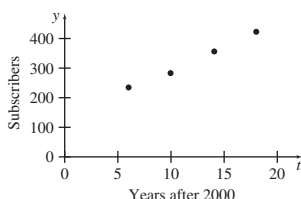
65. (a) 12,000; $y = 12,000x + 3000$ (b) 8 years 1 month 66. (a) 0.9; each additional cupcake costs \$0.90
 (b) $y = 0.9x + 36$ (c) \$198

67. (a)



Yes (b) $y = 598t + 25,522$; the slope indicates that the annual cost of tuition and fees at private four-year colleges is increasing by about \$598 per year. (c) The year 2035 is too far in the future to rely on this equation to predict costs; too many other factors may influence these costs by then.

68. (a)



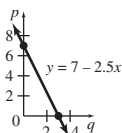
The number of subscribers appears to be increasing at a nearly linear rate.

- (b) $y = 15.729t + 138.67$ (c) $y = 15.688t + 139.42$
 (e) 390.33 million; 390.43 million

69. (a) $y = 4.317t + 87.049$ (b) 173.4, which is slightly more than the actual CPI (c) It is increasing at a rate of approximately 4.3 per year. 70. (a) $y = 0.53t - 0.043$ (b) About 10.2 yr 71. (a) $u = 0.85(220 - x) = 187 - 0.85x$, $l = 0.7(220 - x) = 154 - 0.7x$ (b) 140 to 170 beats per minute (c) 126 to 153 beats per minute (d) The women are 16 and 52. Their pulse is 143 beats per minute. 72. Approximately 4.3 m/sec 73. About 86 yr 74. (a) $y = -1.93t + 267$ (b) 2026 75. (a) $y = 13,104.18t - 406,022$ (b) About 1,166,480 76. (a) $y = 0.12t + 25.12$ (b) $y = 0.14t + 22.54$ (c) Women (d) 2038 (e) 30.6 77. (a) There appears to be a linear relationship. (b) $y = 76.9x$ (c) About 780 megaparsecs (about 1.5×10^{22} mi) (d) About 12.4 billion yr 78. (a) $T = 0.03t + 15$ (b) About 2103 (c) $T = 0.02t + 15$; about 2170 79. (a) $y_o = 4.625t - 19.25$ (b) $y = 4.75t - 41.5$ (c) The percent of Americans who had listened to online radio in the previous month increased by 4.625% per year, while the percent of U.S. cellphone users who had ever listened to online radio in a car using a phone increased by 4.75% per year.

Exercises 1.2 (page 24–27)

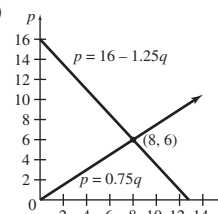
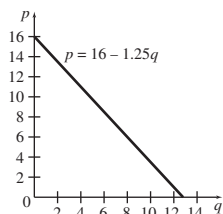
W1. 60 W2.



For exercises . . .	9–18	23–26	27–30, 41, 42, 49, 50	31–36	37–40, 43–48	51–53
Refer to example . . .	1	4	5, 6	2, 3	7	8

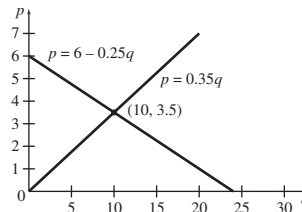
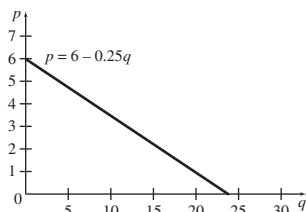
1. True 2. False 3. True 4. True 5. False 6. True 7. True 8. True 9. -3 10. -13 11. 22 12. 12 13. 0
14. 2 15. -4 16. $-9/2$ 17. $7 - 5t$ 18. $2k^2 - 3$ 23. If $R(x)$ is the cost of renting a snowboard for x hours, then $R(x) = 2.25x + 10$. 24. If $C(x)$ is the cost of downloading x songs, then $C(x) = 0.99x + 10$. 25. If $C(x)$ is the cost of parking a car for x hours, then $C(x) = 0.75x + 2$. 26. If $R(x)$ is the cost of renting a car for x miles, then $R(x) = 44 + 0.28x$.
27. $C(x) = 30x + 100$ 28. $C(x) = 45x + 35$ 29. $C(x) = 75x + 550$ 30. $C(x) = 120x + 12,500$ 31. (a) \$16 (b) \$11
(c) \$6 (d) 640 watches (e) 480 watches (f) 320 watches

- (g) (h) 0 watches (i) About 1333 watches (j) About 2667 watches (k)
(l) 800 watches, \$6

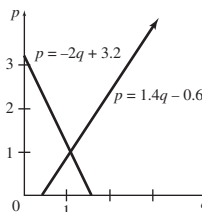
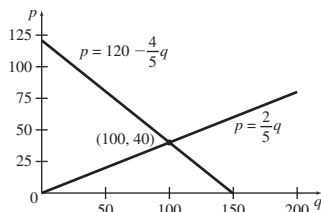


32. (a) \$6 (b) \$5 (c) \$3.90 (d) 600 quarts (e) 1100 quarts (f) 1440 quarts

- (g) (h) 0 quarts (i) 800 quarts (j) 1800 quarts (k)
(l) 1000 quarts; \$3.50



33. (a) (b) 100 tubs, \$40 34. (a) (b) About 1120 lb; about \$0.96



35. $D(q) = 6.9 - 0.4q$ 36. $D(q) = 9 - 0.35q$ 37. (a) 2 units (b) \$980 (c) 52 units 38. (a) 3 units (b) \$3211
(c) 13 units 39. (a) $C(x) = 3.50x + 90$ (b) 17 shirts (c) 108 shirts 40. (a) $C(x) = 2.15x + 525$ (b) 188
(c) 545 books 41. (a) $C(x) = 0.097x + 1.32$ (b) \$1.32 (c) \$98.32 (d) \$98.417 (or \$98.42) (e) 9.7¢ (f) 9.7¢, the cost of
producing one additional cup of coffee would be 9.7¢. 42. (a) $C(x) = 500,000 + 4.75x$ (b) \$500,000 (c) \$975,000
(d) \$4.75; each additional item costs \$4.75 to produce. 43. Break-even quantity is 45 units; don't produce; $P(x) = 20x - 900$
44. Break-even quantity is about 41 units; produce; $P(x) = 145x - 6000$ 45. Break-even quantity is -50 units; impossible to make
a profit when $C(x) > R(x)$ for all positive x ; $P(x) = -10x - 500$ (always a loss) 46. Break-even quantity is -50 units; impossible
to make a profit when $C(x) > R(x)$ for all positive x ; $P(x) = -100x - 5000$ (always a loss). 47. 5 48. 26