CHAPTER 8

Section 8.1

Check Point Exercises

1. a. solution **b.** not a solution **2.** $\{(-2, 5)\}$ **3.** $\{(2, -1)\}$ **4.** $\left\{\left(\frac{60}{17}, -\frac{11}{17}\right)\right\}$ **5.** no solution or $\varnothing$

6. $\{(x, y)|x = 4y - 8\}$ or $\{(x, y)|5x - 20y = -40\}$ **7. a.** $C(x) = 300{,}000 + 30x$ **b.** $R(x) = 80x$ **c.** (6000, 480,000); The company will break even if it produces and sells 6000 pairs of shoes.

Exercise Set 8.1

1. solution **2.** solution **3.** not a solution **4.** not a solution **5.** $\{(1, 3)\}$ **6.** $\{(2, 4)\}$ **7.** $\{(5, 1)\}$ **8.** $\{(-2, 3)\}$ **9.** $\{(-22, -5)\}$
10. $\{(-17, -8)\}$ **11.** $\{(0, 0)\}$ **12.** $\{(0, 0)\}$ **13.** $\{(3, -2)\}$ **14.** $\{(-2, 1)\}$ **15.** $\{(5, 4)\}$ **16.** $\{(-1, -2)\}$ **17.** $\{(7, 3)\}$
18. $\{(-4, 4)\}$ **19.** $\{(2, -1)\}$ **20.** $\{(2, 4)\}$ **21.** $\{(3, 0)\}$ **22.** $\{(4, 1)\}$ **23.** $\{(-4, 3)\}$ **24.** $\{(-6, -2)\}$ **25.** $\{(3, 1)\}$ **26.** $\{(2, -1)\}$
27. $\{(1, -2)\}$ **28.** $\{(-2, -4)\}$ **29.** $\left\{\left(\frac{7}{25}, -\frac{1}{25}\right)\right\}$ **30.** $\left\{\left(\frac{32}{7}, -\frac{20}{7}\right)\right\}$ **31.** $\varnothing$ **32.** $\varnothing$ **33.** $\{(x, y)|y = 3x - 5\}$
34. $\{(x, y)|y = 3x - 4\}$ **35.** $\{(1, 4)\}$ **36.** $\{(3, -2)\}$ **37.** $\{(x, y)|x + 3y = 2\}$ **38.** $\{(x, y)|2x - y = 1\}$ **39.** $\{(-5, -1)\}$
40. $\{(-1, -1)\}$ **41.** $\left\{\left(\frac{29}{22}, -\frac{5}{11}\right)\right\}$ **42.** $\left\{\left(\frac{41}{7}, \frac{36}{7}\right)\right\}$ **43.** $x + y = 7; x - y = -1$; 3 and 4 **44.** $x + y = 2; x - y = 8$; 5 and -3
45. $3x - y = 1; x + 2y = 12$; 2 and 5 **46.** $3x + 2y = 8; 2x - y = 3$; 2 and 1 **47.** $\{(6, -1)\}$ **48.** $\{(8, -1)\}$ **49.** $\left\{\left(\frac{1}{a}, 3\right)\right\}$
50. $\left\{\left(\frac{1}{2a}, \frac{1}{b}\right)\right\}$ **51.** $m = -4, b = 3$ **52.** $m = -6, b = 5$ **53.** $y = x - 4; y = -\frac{1}{3}x + 4$ **54.** $y = \frac{1}{3}x + 2, y = \frac{1}{3}x - 2$
55. 500 radios **56.** more than 500 radios **57.** -6000; When the company produces and sells 200 radios, the loss is \$6000.
58. -4000; When the company produces and sells 300 radios, the loss is \$4000. **59. a.** $P(x) = 20x - 10{,}000$ **b.** \$190,000
60. a. $P(x) = 20x - 10{,}000$ **b.** \$390,000 **61. a.** $C(x) = 18{,}000 + 20x$ **b.** $R(x) = 80x$ **c.** (300, 24,000); When 300 canoes are produced and sold, both revenue and cost are \$24,000. **62. a.** $C(x) = 100{,}000 + 100x$ **b.** $R(x) = 300x$ **c.** (500, 150,000); When 500 bicycles are produced and sold, both cost and revenue are \$150,000. **63. a.** $C(x) = 30{,}000 + 2500x$ **b.** $R(x) = 3125x$ **c.** (48, 150,000); For 48 sold-out performances, both cost and revenue are \$150,000. **64. a.** $C(x) = 30{,}000 + 0.02x$ **b.** $R(x) = 0.5x$ **c.** (62,500, 31,250); For 62,500 cards, both cost and revenue are \$31,250. **65. a.** 4 million workers; \$4.50 per hour **b.** \$4.50; 4; 4 **c.** 2 million **d.** 5.7 million **e.** 3.7 million
66. a. 20 thousand apartments; \$1000 **b.** \$1000; 20,000; 20,000 **67.** 2009; 18.5% pro-choice and 18.5% pro-life **68.** 2020; 48% for and 48% against **69. a.** $y = 0.45x + 0.8$ **b.** $y = 0.15x + 2.6$ **b.** week 6; 3.5 symptoms; by the intersection point (6, 3.5)
70. a. $y = 5.48 + 0.04x$ **b.** $y = 1.84 + 0.17x$ **c.** 2028; 6.6%; Medicare **71. a.** $y = -0.54x + 38$ **b.** $y = -0.79x + 40$ **c.** 1993; 33.68%
72. a. $y = -0.58x + 38.9$ **b.** $y = -0.79x + 40$ **c.** 1990; 36% **73.** Mr. Goodbar: 264 cal; Mounds: 258 cal **74.** Snickers: 273 cal; Reese's Peanut Butter Cup: 232 cal **75.** 3 Mr. Goodbars and 2 Mounds bars **76.** 7 Snickers and 5 Reese's Peanut Butter Cups **77.** 50 rooms with kitchen facilities, 150 rooms without kitchen facilities **78.** two-seat table: 6; four-seat table: 11 **79.** 100 ft long by 80 ft wide **80.** 90 ft long by 70 ft wide **81.** rate rowing in still water: 6 mph; rate of the current: 2 mph **82.** plane's rate in still air: 180 mph; rate of the wind: 20 mph
83. 80°, 50°, 50° **84.** 30°, 75°, 75° **94.** makes sense **95.** makes sense **96.** does not make sense **97.** makes sense
99. $y = \frac{a_1c_2 - a_2c_1}{a_1b_2 - a_2b_1}; x = \frac{b_2c_1 - b_1c_2}{a_1b_2 - a_2b_1}$ **100.** the twin who always lies **101.** Yes; 8 hexagons and 4 squares **103.** yes **104.** $11x + 4y = -3$
105. $1682 = 16a + 4b + c$

Section 8.2

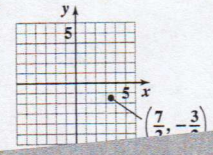
Check Point Exercises

1. $(-1) - 2(-4) + 3(5) = 22; 2(-1) - 3(-4) - 5 = 5; 3(-1) + (-4) - 5(5) = -32$ **2.** $\{(1, 4, -3)\}$ **3.** $\{(4, 5, 3)\}$ **4.** $y = 3x^2 - 12x + 13$

Exercise Set 8.2

1. solution **2.** solution **3.** solution **4.** solution **5.** $\{(2, 3, 3)\}$ **6.** $\{(1, -1, 1)\}$ **7.** $\{(2, -1, 1)\}$ **8.** $\{(1, -1, 2)\}$ **9.** $\{(1, 2, 3)\}$
10. $\{(-1, -2, 3)\}$ **11.** $\{(3, 1, 5)\}$ **12.** $\{(1, 1, 2)\}$ **13.** $\{(1, 0, -3)\}$ **14.** $\{(0, 0, 4)\}$ **15.** $\{(1, -5, -6)\}$ **16.** $\{(2, 2, 2)\}$
17. $\left\{\left(\frac{1}{2}, \frac{1}{3}, -1\right)\right\}$ **18.** $\left\{\left(\frac{1}{2}, 3, -2\right)\right\}$ **19.** $y = 2x^2 - x + 3$ **20.** $y = 2x^2 - x - 3$ **21.** $y = 2x^2 + x - 5$ **22.** $y = x^2 - 6x + 8$
23. 7, 4, and 5 **24.** -1, 2, and 3 **25.** $\{(4, 8, 6)\}$ **26.** $\{(-3, 0, 2)\}$ **27.** $y = -\frac{3}{4}x^2 + 6x - 11$ **28.** $y = x^2 - 9x + 22$
29. $\left\{\left(\frac{8}{a}, -\frac{3}{b}, -\frac{5}{c}\right)\right\}$ **30.** $\left\{\left(-\frac{9}{a}, \frac{5}{b}, \frac{5}{c}\right)\right\}$ **31. a.** $y = -16x^2 + 40x + 200$ **b.** $y = 0$ when $x = 5$; The ball hits the ground after 5 seconds.
32. a. $y = -4x^2 + 50x$ **b.** 156; When a car is in motion for 6 seconds after the brakes are applied, it travels 156 feet. **33.** water: 58%; fat: 23%; protein: 14% **34.** water: 62%; fat: 15%; protein: 17% **35.** 200 \$8 tickets; 150 \$10 tickets; 50 \$12 tickets **36.** 5 packages of 6, 3 packages of 12, and 4 packages of 24 **37.** \$1200 at 8%, \$2000 at 10%, and \$3500 at 12% **38.** \$4000 at 10%, \$8000 at 12%, and \$5000 at 15%
39. $x = 60, y = 55, z = 65$ **46.** does not make sense **47.** does not make sense **48.** makes sense **49.** makes sense
51. 13 triangles, 21 rectangles, and 6 pentagons **53.** $\frac{x + 14}{(x - 4)(x + 2)}$ **54.** $\frac{5x^3 - 3x^2 + 7x - 3}{(x^2 + 1)^2}$ **55.** $\{(5, -2, 3)\}$

11.



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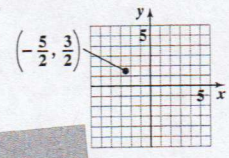

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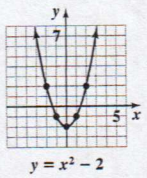
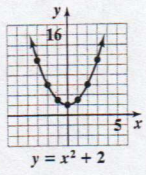


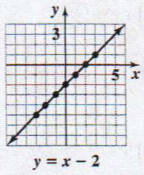
$y = x^2 - 2$

14.

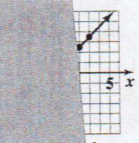


$y = x^2 + 2$

15.



$y = x - 2$



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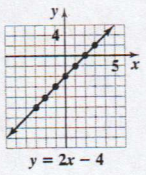
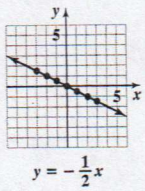
18.



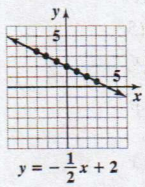
$y = 2x - 4$

19.

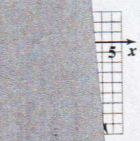


$y = -\frac{1}{2}x$

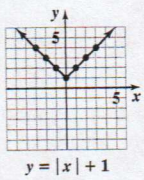
20.



$y = -\frac{1}{2}x + 2$

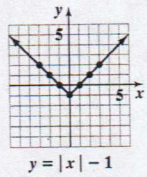


23.



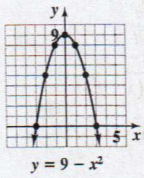
$y = |x| + 1$

24.

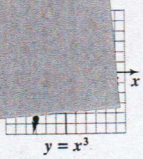


$y = |x| - 1$

25.



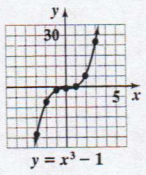
$y = 9 - x^2$



$y = -x^2$

$y = x^3$

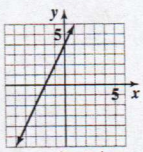
28.



$y = x^3 - 1$

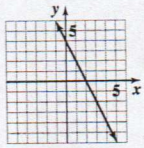
29. c **30.** d **31.** b **32.** a
33. c **34.** b **35.** no **36.** yes
37. (2, 0) **38.** (0, 2) **39.** (−2, 4) and (1, 1)
40. −2 and 1 **41. a.** 2 **b.** −4
42. a. 1 **b.** 2 **43. a.** 1, −2 **b.** 2
44. a. 1, −1 **b.** 1 **45. a.** −1 **b.** none
46. a. none **b.** 2

47. $y = 2x + 4$



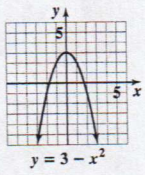
$y = 2x + 4$

48. $y = 4 - 2x$



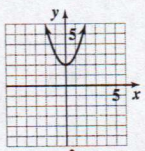
$y = 4 - 2x$

49. $y = 3 - x^2$



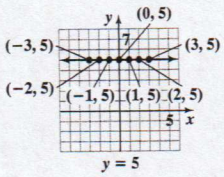
$y = 3 - x^2$

50. $y = x^2 + 2$



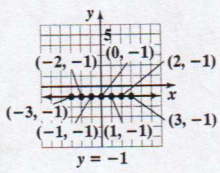
$y = x^2 + 2$

51.



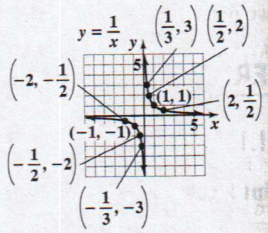
$y = 5$

52.

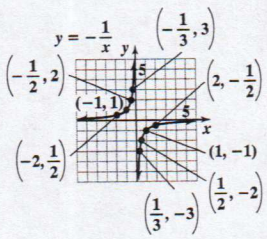


$y = -1$

53.



54.



55. a. 20% **b.** 18%; underestimates by 2% **c.** Answers will vary.; approximately 45%
d. 44%; It's less than the estimate. **e.** 1990; 14%
56. a. 50% **b.** 50%; The model provides an exact description of the data.
c. Answers will vary.; approximately 22% **d.** 20%; It's less than the estimate. **e.** 1980; 72%
57. 8; 1 **58.** 65; 8 **59.** about 1.9 **60.** about 1.1 **67.** makes sense **68.** does not make sense
69. does not make sense **70.** does not make sense **71.** false **72.** false **73.** true
74. false **75.** a **76.** d **77.** b **78.** c **79.** b **80.** a **81.** c **82.** b **83.** true **84.** $-x + 10$ **85.** $9x - 24$

Section 1.2

Check Point Exercises

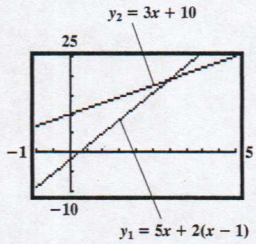
1. {6} **2.** {5} **3.** {1} **4.** {3} **5.** ∅ **6.** 11 **7.** ∅; inconsistent equation **8.** 3.7; by the point (3.7, 10)

Exercise Set 1.2

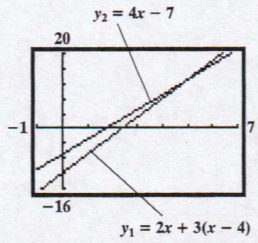
1. {11} **2.** {11} **3.** {7} **4.** $\left\{\frac{25}{3}\right\}$ **5.** {13} **6.** {8} **7.** {2} **8.** {−19} **9.** {9} **10.** {−1} **11.** {−5} **12.** {−4}
13. {6} **14.** {3} **15.** {−2} **16.** $\left\{-\frac{81}{11}\right\}$ **17.** {12} **18.** {30} **19.** {24} **20.** {15} **21.** {−15} **22.** {−20} **23.** {5}
24. {7} **25.** $\left\{\frac{33}{2}\right\}$ **26.** {1} **27.** {−12} **28.** {−19} **29.** $\left\{\frac{46}{5}\right\}$ **30.** $\left\{\frac{25}{7}\right\}$ **31. a.** 0 **b.** $\left\{\frac{1}{2}\right\}$ **32. a.** 0 **b.** $\left\{\frac{5}{12}\right\}$
33. a. 0 **b.** {−2} **34. a.** 0 **b.** $\left\{\frac{1}{4}\right\}$ **35. a.** 0 **b.** {2} **36. a.** 0 **b.** {3} **37. a.** 0 **b.** {4} **38. a.** 0 **b.** {8}
39. a. 1 **b.** {3} **40. a.** −4 **b.** {−3} **41. a.** −1 **b.** ∅ **42. a.** 2 **b.** ∅ **43. a.** 1 **b.** {2} **44. a.** −3, 2 **b.** {−8}

45. a. $-2, 2$ b. $\varnothing$ **46.** a. $-2, 2$ b. $\varnothing$ **47.** a. $-1, 1$ b. $\{-3\}$ **48.** a. $-5, 5$ b. $\{7\}$ **49.** a. $-2, 4$ b. $\varnothing$
50. a. $-3, 2$ b. $\{7\}$ **51.** 6 **52.** 3 **53.** -7 **54.** 59 **55.** 2 **56.** 3 **57.** 19 **58.** 6 **59.** -1 **60.** 1 **61.** identity
62. inconsistent equation **63.** inconsistent equation **64.** identity **65.** conditional equation **66.** conditional equation
67. inconsistent equation **68.** inconsistent equation **69.** $\{-7\}$; conditional equation **70.** $\left\{\frac{46}{5}\right\}$; conditional equation
71. $\varnothing$; inconsistent equation **72.** $\varnothing$; inconsistent equation **73.** $\{-4\}$; conditional equation **74.** all real numbers; identity
75. $\{8\}$; conditional equation **76.** $\{6\}$; conditional equation **77.** $\{-1\}$; conditional equation **78.** $\{3\}$; conditional equation
79. $\varnothing$; inconsistent equation **80.** $\left\{\frac{1}{7}\right\}$; conditional equation **81.** $3(x - 4) = 3(2 - 2x)$; $\{2\}$ **82.** $3(2x - 5) = 5x + 2$; $\{17\}$
83. $-3(x - 3) = 5(2 - x)$; $\{0.5\}$ **84.** $2x - 5 = 4(3x + 1) - 2$; $\{-0.7\}$ **85.** 2 **86.** 6 **87.** -7 **88.** -5 **89.** $\{-2\}$ **90.** $\{3\}$
91. $\varnothing$ or no solution **92.** $\varnothing$ or no solution **93.** $\{10\}$ **94.** $\{0\}$ **95.** $\{-2\}$ **96.** $\left\{\frac{4}{3}\right\}$ **97.** 142 pounds; 13 pounds
98. 178 pounds; 6 pounds **99.** a. \$32,000 b. \$32,616; \$616 c. \$32,597; \$597 **100.** a. \$24,000 b. \$23,966; \$34 c. \$24,197; \$197
101. 2013 **102.** 2025 **103.** 11 learning trials; (11, 0.95) **104.** 1 learning trial; (1, 0.5) **105.** 125 liters **106.** a. $C = \dfrac{x + 0.35(200)}{x + 200}$
b. 300 liters

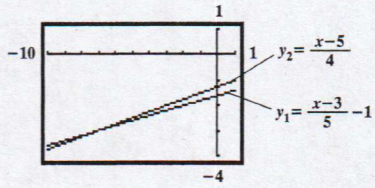
116. $\{3\}$



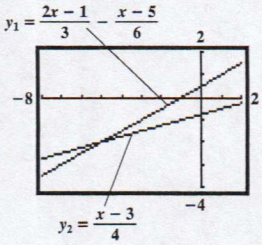
117. $\{5\}$



118. $\{-7\}$



119. $\{-5\}$



120. does not make sense **121.** makes sense **122.** makes sense **123.** makes sense
124. false **125.** false **126.** true **127.** false
129. 2 **130.** 20 **131.** $x + 150$ **132.** $20 + 0.05x$ **133.** $4x + 400$

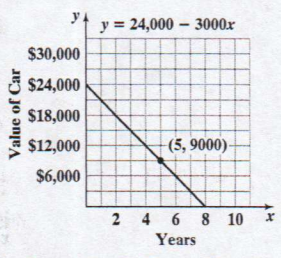
Section 1.3

Check Point Exercises

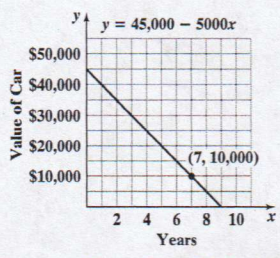
1. women: \$57,989; men: \$72,026 **2.** by 50 years after 1969, or in 2019 **3.** 300 min **4.** \$1200 **5.** \$3150 at 9%; \$1850 at 11%
6. 50 ft by 94 ft **7.** $w = \dfrac{P - 2l}{2}$ **8.** $C = \dfrac{P}{1 + M}$

Exercise Set 1.3

1. 6 **2.** 7 **3.** 25 **4.** 40 **5.** 120 **6.** 140 **7.** 320 **8.** 360 **9.** 19 and 45 **10.** 17 and 41 **11.** 2 **12.** 5 **13.** 8
14. 2 **15.** all real numbers **16.** 1 **17.** 5 **18.** -9 **19.** radio: 974 hr; TV: 1555 hr **20.** Americans: 3.9 weeks; Italians: 7.9 weeks
21. carpenters: \$35,580; computer programmers: \$63,420 **22.** janitors: \$19,390; registered nurses: \$54,670 **23.** by 38 years after 1983, or in 2021
24. by 30 years after 1986, or in 2016
25. a. $y = 24{,}000 - 3000x$ b. after 5 years
c.



26. a. $y = 45{,}000 - 5000x$ b. after 7 years
c.



27. after 5 months; \$165 **28.** 10 rentals; \$90 **29.** 30 times **30.** 20 times **31.** a. 2014; 22,300 students
b. $y_1 = 13{,}300 + 1000x$; $y_2 = 26{,}800 - 500x$ **32.** 2025; 9,900,000 **33.** \$420 **34.** \$44 **35.** \$150 **36.** \$240 **37.** \$467.20 **38.** \$12
39. \$2000 at 6%; \$5000 at 8% **40.** \$5000 at 5%; \$6000 at 8% **41.** \$6000 at 12%; \$2000 at a 5% loss **42.** \$7000 at 14%; \$5000 at a 6% loss
43. 50 yd by 100 yd **44.** 40 ft by 120 ft **45.** 36 ft by 78 ft **46.** 23 m by 40 m **47.** 2 in. **48.** 6 ft **49.** 11 hr **50.** 17 hr
51. 5 ft 7 in. **52.** \$1350 **53.** 7 oz **54.** 11 min **55.** $w = \dfrac{A}{l}$ **56.** $R = \dfrac{D}{T}$ **57.** $b = \dfrac{2A}{h}$ **58.** $B = \dfrac{3V}{h}$ **59.** $P = \dfrac{I}{rt}$ **60.** $r = \dfrac{C}{2\pi}$
61. $m = \dfrac{E}{c^2}$ **62.** $h = \dfrac{V}{\pi r^2}$ **63.** $p = \dfrac{T - D}{m}$ **64.** $M = \dfrac{P - C}{C}$ **65.** $a = \dfrac{2A}{h} - b$ **66.** $b = \dfrac{2A}{h} - a$ **67.** $r = \dfrac{S - P}{Pt}$
68. $t = \dfrac{S - P}{Pr}$ **69.** $S = \dfrac{F}{B} + V$ **70.** $r = -\dfrac{C}{S} + 1$ **71.** $I = \dfrac{E}{R + r}$ **72.** $h = \dfrac{A - 2lw}{2l + 2w}$ **73.** $f = \dfrac{pq}{p + q}$ **74.** $R_1 = \dfrac{RR_2}{R_2 - R}$