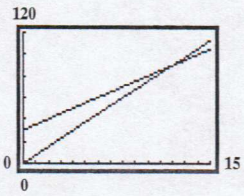
80. a. $F = 30 + 5x$; $F = 7.5x$

b.



c. (12, 90); For 12 hours, both options cost the same, \$90.

81. does not make sense **82.** makes sense **83.** does not make sense **84.** does not make sense **85.** North campus had 600 students; South campus had 400 students. **86.** \$200 **87.** Coburn = 60 years old; woman = 20 years old **88.** 10 correct answers **89.** \$4000 for the mother; \$8000 for the boy; \$2000 for the girl **90.** 36 plants **91.** $C = \dfrac{VL - SN}{L - N}$ **93.** $-14 - 29x + 15x^2$ or $15x^2 - 29x - 14$ **94.** $\sqrt{2}$ **95.** $-\dfrac{54 + 43\sqrt{2}}{46}$

Section 1.4

Check Point Exercises

1. a. $8 + i$ **b.** $-10 + 7i$ **2. a.** $63 + 14i$ **b.** $58 - 11i$ **3.** $\frac{16}{17} + \frac{21}{17}i$ **4. a.** $7i\sqrt{3}$ **b.** $1 - 4i\sqrt{3}$ **c.** $-7 + i\sqrt{3}$

Exercise Set 1.4

1. $8 - 2i$ **2.** $2 + 5i$ **3.** $-2 + 9i$ **4.** $2 + 16i$ **5.** $24 - 3i$ **6.** $33 - i$ **7.** $-14 + 17i$ **8.** $-12 + 26i$ **9.** $21 + 15i$ **10.** $16 + 56i$ **11.** $-19 + 7i$ **12.** $-4 - 28i$ **13.** $-29 - 11i$ **14.** $12 + 84i$ **15.** 34 **16.** 53 **17.** 26 **18.** 50 **19.** $-5 + 12i$ **20.** $21 - 20i$ **21.** $\frac{3}{5} + \frac{1}{5}i$ **22.** $\frac{12}{17} - \frac{3}{17}i$ **23.** $1 + i$ **24.** $-1 + 2i$ **25.** $-\frac{24}{25} + \frac{32}{25}i$ **26.** $-\frac{12}{13} - \frac{18}{13}i$ **27.** $\frac{7}{5} + \frac{4}{5}i$ **28.** $-i$ **29.** $3i$ **30.** $-3i$ **31.** $47i$ **32.** $19i\sqrt{2}$ **33.** $-8i$ **34.** $16 + 30i$ **35.** $2 + 6i\sqrt{7}$ **36.** $-7 - 4i\sqrt{11}$ **37.** $-\frac{1}{3} + i\frac{\sqrt{2}}{6}$ **38.** $-\frac{3}{8} + i\frac{\sqrt{7}}{16}$ **39.** $-\frac{1}{8} - i\frac{\sqrt{3}}{24}$ **40.** $-\frac{5}{11} - i\frac{\sqrt{2}}{11}$ **41.** $-2\sqrt{6} - 2i\sqrt{10}$ **42.** $-4\sqrt{3} - 2i\sqrt{6}$ **43.** $24\sqrt{15}$ **44.** $-12\sqrt{14}$ **45.** $-11 - 5i$ **46.** $23 + 10i$ **47.** $-5 + 10i$ **48.** $18 - 12i$ **49.** $0 + 47i$ or $47i$ **50.** $0 + 19i\sqrt{2}$ or $19i\sqrt{2}$ **51.** 0 **52.** 0 **53.** $\frac{20}{13} + \frac{30}{13}i$ **54.** $-\frac{3}{5} - \frac{4}{5}i$ **55.** $(47 + 13i)$ volts **56.** $(21 + i)$ volts **57.** $(5 + i\sqrt{15}) + (5 - i\sqrt{15}) = 10$; $(5 + i\sqrt{15})(5 - i\sqrt{15}) = 25 - 15i^2 = 25 + 15 = 40$ **67.** makes sense **68.** does not make sense **69.** does not make sense **70.** makes sense **71.** false **72.** false **73.** false **74.** true **75.** $\frac{14}{25} - \frac{2}{25}i$ **76.** $\frac{6}{5} + 0i$ or $\frac{6}{5}$ **77.** $\frac{8}{5} + \frac{16}{5}i$ **78.** $(2x - 1)(x + 4)$ **79.** $(x - 3)(x - 3)$ or $(x - 3)^2$ **80.** -5

Section 1.5

Check Point Exercises

1. a. $\{0, 3\}$ **b.** $\left\{-1, \frac{1}{2}\right\}$ **2. a.** $\{-\sqrt{7}, \sqrt{7}\}$ **b.** $\{-3i, 3i\}$ **c.** $\{-5 + \sqrt{11}, -5 - \sqrt{11}\}$ **3. a.** 9; $x^2 + 6x + 9 = (x + 3)^2$ **b.** $\frac{25}{4}$; $x^2 - 5x + \frac{25}{4} = \left(x - \frac{5}{2}\right)^2$ **c.** $\frac{1}{9}$; $x^2 + \frac{2}{3}x + \frac{1}{9} = \left(x + \frac{1}{3}\right)^2$ **4.** $\{-2 \pm \sqrt{5}\}$ **5.** $\left\{\frac{-3 + \sqrt{41}}{4}, \frac{-3 - \sqrt{41}}{4}\right\}$ **6.** $\left\{\frac{-1 + \sqrt{3}}{2}, \frac{-1 - \sqrt{3}}{2}\right\}$ **7.** $\{1 + i, 1 - i\}$ **8. a.** 0; one real solution that is rational **b.** 81; two rational solutions **c.** -44; two imaginary solutions that are complex conjugates **9.** approximately 26 years old **10.** 20 in.

Exercise Set 1.5

1. $\{-2, 5\}$ **2.** $\{4, 9\}$ **3.** $\{3, 5\}$ **4.** $\{-10, -1\}$ **5.** $\left\{-\frac{5}{2}, \frac{2}{3}\right\}$ **6.** $\left\{-\frac{2}{3}, -\frac{1}{3}\right\}$ **7.** $\left\{-\frac{4}{3}, 2\right\}$ **8.** $\left\{\frac{1}{4}, 3\right\}$ **9.** $\{-4, 0\}$ **10.** $\{0, 4\}$ **11.** $\left\{0, \frac{1}{3}\right\}$ **12.** $\left\{\frac{5}{4}\right\}$ **13.** $\{-3, 1\}$ **14.** $\left\{\frac{1}{2}, 1\right\}$ **15.** $\{-3, 3\}$ **16.** $\{-3, 3\}$ **17.** $\{-\sqrt{10}, \sqrt{10}\}$ **18.** $\{-4, 4\}$ **19.** $\{\pm 5i\}$ **20.** $\{\pm 2i\}$ **21.** $\{-7, 3\}$ **22.** $\{-3, 9\}$ **23.** $\{4 \pm \sqrt{5}\}$ **24.** $\{-4 \pm \sqrt{7}\}$ **25.** $\{-3 \pm 4i\}$ **26.** $\{1 \pm 3i\}$ **27.** $\{3 \pm i\sqrt{5}\}$ **28.** $\{-2 \pm i\sqrt{7}\}$ **29.** $\left\{-\frac{5}{3}, \frac{1}{3}\right\}$ **30.** $\left\{-\frac{3}{4}, \frac{5}{4}\right\}$ **31.** $\left\{\frac{1 - \sqrt{7}}{5}, \frac{1 + \sqrt{7}}{5}\right\}$ **32.** $\left\{\frac{3 - \sqrt{5}}{8}, \frac{3 + \sqrt{5}}{8}\right\}$ **33.** $\left\{\frac{4 - 2\sqrt{2}}{3}, \frac{4 + 2\sqrt{2}}{3}\right\}$ **34.** $\left\{\frac{-8 - 3\sqrt{3}}{2}, \frac{-8 + 3\sqrt{3}}{2}\right\}$ **35.** 36; $x^2 + 12x + 36 = (x + 6)^2$ **36.** 64; $x^2 + 16x + 64 = (x + 8)^2$ **37.** 25; $x^2 - 10x + 25 = (x - 5)^2$ **38.** 49; $x^2 - 14x + 49 = (x - 7)^2$ **39.** $\frac{9}{4}$; $x^2 + 3x + \frac{9}{4} = \left(x + \frac{3}{2}\right)^2$ **40.** $\frac{25}{4}$; $x^2 + 5x + \frac{25}{4} = \left(x + \frac{5}{2}\right)^2$ **41.** $\frac{49}{4}$; $x^2 - 7x + \frac{49}{4} = \left(x - \frac{7}{2}\right)^2$ **42.** $\frac{81}{4}$; $x^2 - 9x + \frac{81}{4} = \left(x - \frac{9}{2}\right)^2$ **43.** $\frac{1}{9}$; $x^2 - \frac{2}{3}x + \frac{1}{9} = \left(x - \frac{1}{3}\right)^2$ **44.** $\frac{4}{25}$; $x^2 + \frac{4}{5}x + \frac{4}{25} = \left(x + \frac{2}{5}\right)^2$ **45.** $\frac{1}{36}$; $x^2 - \frac{1}{3}x + \frac{1}{36} = \left(x - \frac{1}{6}\right)^2$ **46.** $\frac{1}{64}$; $x^2 - \frac{1}{4}x + \frac{1}{64} = \left(x - \frac{1}{8}\right)^2$ **47.** $\{-7, 1\}$ **48.** $\{-4, -2\}$ **49.** $\{1 + \sqrt{3}, 1 - \sqrt{3}\}$ **50.** $\{-6, 2\}$ **51.** $\{3 + 2\sqrt{5}, 3 - 2\sqrt{5}\}$ **52.** $\{1 + \sqrt{6}, 1 - \sqrt{6}\}$ **53.** $\{-2 + \sqrt{3}, -2 - \sqrt{3}\}$ **54.** $\{-3 + \sqrt{14}, -3 - \sqrt{14}\}$ **55.** $\{2, 3\}$ **56.** $\{-8, 1\}$ **57.** $\left\{\frac{-3 + \sqrt{13}}{2}, \frac{-3 - \sqrt{13}}{2}\right\}$ **58.** $\left\{\frac{3 + \sqrt{29}}{2}, \frac{3 - \sqrt{29}}{2}\right\}$ **59.** $\left\{\frac{1}{2}, 3\right\}$ **60.** $\left\{-3, \frac{1}{2}\right\}$ **61.** $\left\{\frac{1 + \sqrt{2}}{2}, \frac{1 - \sqrt{2}}{2}\right\}$ **62.** $\left\{\frac{2 + \sqrt{6}}{2}, \frac{2 - \sqrt{6}}{2}\right\}$ **63.** $\left\{\frac{1 + \sqrt{7}}{3}, \frac{1 - \sqrt{7}}{3}\right\}$ **64.** $\left\{\frac{5 + \sqrt{145}}{6}, \frac{5 - \sqrt{145}}{6}\right\}$ **65.** $\{-5, -3\}$ **66.** $\{-6, -2\}$ **67.** $\left\{\frac{-5 + \sqrt{13}}{2}, \frac{-5 - \sqrt{13}}{2}\right\}$ **68.** $\left\{\frac{-5 + \sqrt{17}}{2}, \frac{-5 - \sqrt{17}}{2}\right\}$ **69.** $\left\{\frac{3 + \sqrt{57}}{6}, \frac{3 - \sqrt{57}}{6}\right\}$