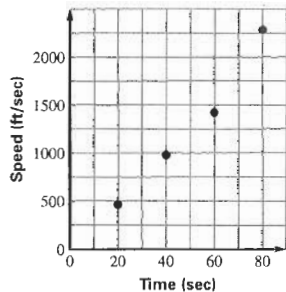


# CHAPTER 6

## Think & Discuss (p. 321)

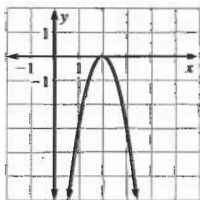
1. Shuttle Speed After Launch about 41 seconds



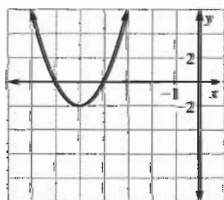
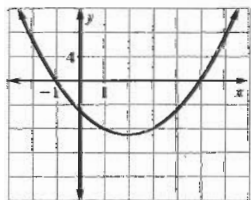
2. A quadratic function would be a good model because the data lies on a curve.

## Skill Review (p. 322)

- $4x^2 - 2x + x - x^2 = 3x^2 - x = x(3x - 1)$
- $2(8x + 5) - 19x = 16x + 10 - 19x = -3x + 10$
- $-x^3 - 5x^4 - 3x^3 + 7x^2 = -5x^4 - 4x^3 + 7x^2 = x^2(-5x^2 - 4x + 7)$
- $y = -3(x - 2)^2$



- $y = (x + 1)(x - 5)$
- $y = 2(x + 6)(x + 4)$



- $y = (x - 1)^2 - 7$   
 $= x^2 - 2x + 1 - 7$   
 $= x^2 - 2x - 6$
- $y = 2(x + 4)^2$   
 $= 2(x^2 + 8x + 16)$   
 $= 2x^2 + 16x + 32$
- $y = -(x - 2)(x + 8)$   
 $= (x^2 + 6x - 16)$   
 $= -x^2 - 6x + 16$
- $x^2 + 6x - 27 = 0$   
 $x^2 + 6x + 9 = 27 + 9$   
 $(x + 3)^2 = 36$   
 $x + 3 = \pm 6$   
 $x = -3 \pm 6$   
 $x = -9$  or  
 $x = 3$

11.  $x^2 + 20x + 100 = 0$

$$(x + 10)^2 = 0$$

$$x + 10 = 0$$

$$x = -10$$

12.  $2x^2 + 5x = 12$

$$2\left(x^2 + \frac{5}{2}x + \frac{25}{16}\right) = 12 + \frac{25}{8}$$

$$2\left(x + \frac{5}{4}\right)^2 = \frac{121}{8}$$

$$\left(x + \frac{5}{4}\right)^2 = \frac{121}{16}$$

$$x + \frac{5}{4} = \pm \frac{11}{4}$$

$$x = -\frac{5}{4} \pm \frac{11}{4}$$

$$x = -4 \text{ or } x = \frac{3}{2}$$

## Lesson 6.1

### Activity (p. 323)

- 7;  $2^7$
- a.  $2^7$  b.  $2^7$  c.  $2^9$  d.  $2^8$
- $2^{m+n}$
- a.  $2^2$  b.  $2^3$  c.  $2^4$  d.  $2^4$  e.  $2^{m-n}$

### 6.1 Guided Practice (p. 326)

- product of powers
  - power of a power
  - power of a product
- The bases were multiplied;  $(-2)^5$
  - The exponents were divided when they should have been subtracted;  $x^6$
  - The exponents were multiplied when they should have been added;  $x^7$
- 216; product of powers
- 1; power of a power and product of powers
- 64; power of a power
- 3; negative exponent, power of power, and product of powers
- $\frac{25}{9}$ ; negative exponent and power of a quotient
- $\frac{1}{49}$ ; negative exponent quotient of power
- 1; product of powers
- $\frac{x^6 y^4}{z}$ ; negative exponent, power of a power, and product of powers
- $\frac{1}{16x^6}$ ; negative exponent and power of a power
- $64x^{18}$ ; power of a quotient, negative exponent, and product of powers
- $3y^3$ ; quotient of powers
- $x^3 y^5$ ; negative exponent, power of a product, quotient of powers, and product of powers

## Chapter 6 continued

$$15. \frac{\frac{4}{3}\pi(6.96 \times 10^5)^3}{\frac{4}{3}\pi(6.38 \times 10^3)^3} = \frac{\frac{4}{3}\pi(3.37 \times 10^{17})}{\frac{4}{3}\pi(2.60 \times 10^{11})} = \frac{1.41 \times 10^{18}}{1.09 \times 10^{12}} = 1.29 \times 10^6$$

sun's volume:  $1.41 \times 10^{18} \text{ km}^3$

Earth's volume:  $1.09 \times 10^{12} \text{ km}^3$

Ratio is about 1,290,000. Yes, the results match.

### 6.1 Practice and Applications (pp. 326–328)

$$16. 4^{2+4} = 4^6 = 4096 \quad 17. 5^{-6} = \frac{1}{5^6} = \frac{1}{15,625}$$

$$18. (-9)^{3+1} = (-9)^4 = 6561 \quad 19. 8^6 = 262,144$$

$$20. 5^{2-5} = 5^{-3} = \frac{1}{5^3} = \frac{1}{125} \quad 21. \left(\frac{3}{7}\right)^3 = \frac{3^3}{7^3} = \frac{27}{343}$$

$$22. \left(\frac{5}{9}\right)^{-3} = \frac{5^{-3}}{9^{-3}} = \frac{9^3}{5^3} = \frac{729}{125} \quad 23. 11^{-2+0} = \frac{1}{11^2} = \frac{1}{121}$$

$$24. 4^{-2-(-3)} = 4^1 = 4 \quad 25. \left(\frac{1}{8}\right)^{-4} = \frac{1^{-4}}{8^{-4}} = 8^4 = 4096$$

$$26. 2^8 = 256 \quad 27. \frac{2^2}{2^{-9}} = 2^2 \cdot 2^9 = 2^{9+2} = 2^{11} = 2048$$

$$28. \frac{6^2}{6^4 \cdot 5^{-2}} = 6^{2-4} \cdot 5^2 = 6^{-2} \cdot 5^2 = \frac{5^2}{6^2} = \frac{25}{36}$$

$$29. 6^{0+3} \cdot \frac{1}{6^4} = 6^{3-4} = 6^{-1} = \frac{1}{6} \quad 30. \frac{1}{10^3} \cdot 10^3 = 1$$

$$31. \left(\frac{2}{5}\right)^{-6} = \frac{2^{-6}}{5^{-6}} = \frac{5^6}{2^6} = \frac{15,625}{64} \quad 32. x^{8-3} = x^5$$

$$33. 2^{15}x^{10} = 32,768x^{10} \quad 34. \frac{1}{x^2y^2} \quad 35. x^5 \cdot x^2 = x^{5+2} = x^7$$

$$36. x^{5-4}y^{2-0} = xy^2 \quad 37. \frac{1}{(x^4y^7)^3} = \frac{1}{x^{12}y^{21}}$$

$$38. x^{11} \cdot x^3 \cdot y^{10} \cdot y^1 = x^{11+3}y^{10+1} = x^{14}y^{11}$$

$$39. -3\frac{y^0}{x^4} = \frac{-3}{x^4} \quad 40. \frac{1}{(10x^3y^5)^3} = \frac{1}{1000x^9y^{15}}$$

$$41. \frac{y \cdot y^2}{x \cdot x} = \frac{y^{1+2}}{x^{1+1}} = \frac{y^3}{x^2} \quad 42. \frac{1}{(4x^2y^5)^2} = \frac{1}{16x^4y^{10}}$$

$$43. \frac{2x^2y \cdot y}{6x} = \frac{1}{3}x^{2-1}y^{1+1} = \frac{1}{3}xy^2$$

$$44. \frac{5}{20}x^{3-2}y^{9+2} = \frac{1}{4}xy^{11}$$

$$45. \frac{xy^9}{3y^{-2}} \cdot \frac{-7y}{21x^5} = \frac{-1xy^{9+1}}{9x^5y^{-2}} = \frac{-1}{9}x^{1-5}y^{10+2} = \frac{-1}{9}x^{-4}y^{12} = -\frac{y^{12}}{9x^4}$$

$$46. \frac{y^{10}}{2x^3} \cdot \frac{20x^{14}}{xy^6} = \frac{10x^{14}y^{10}}{x^3+1y^6} = \frac{10x^{14}y^{10}}{x^4y^6} = 10x^{14-4}y^{10-6} = 10x^{10}y^4$$

$$47. \frac{12xy}{7x^4} \cdot \frac{7x^5y^2}{4y} = \frac{3x^5+1y^{1+2}}{x^4 \cdot y} = 3x^{6-4}y^{3-1} = 3x^2y^2$$

$$48. A = \frac{\sqrt{3}}{4} \left(\frac{x}{2}\right)^2 = \frac{\sqrt{3} \cdot x^2}{4 \cdot 4} = \frac{\sqrt{3}}{16}x^2$$

$$49. A = (4x)^2\pi = 16x^2\pi \quad 50. V = \pi(2x)^2x = 4x^3\pi$$

$$51. V = \frac{4}{3}\pi\left(\frac{x}{3}\right)^3 = \frac{4}{3}\pi\frac{x^3}{27} = \frac{4}{81}\pi x^3$$

$$52. \frac{\text{National debt}}{\text{population}} = \frac{\$5.608 \times 10^{12}}{2.73 \times 10^8} = \frac{\$5.608 \times 10^4}{2.73} = \$2.054 \times 10^4$$

$$53. \text{France} = \frac{\$1.2496 \times 10^{12}}{5.8607 \times 10^7} = \$2.13 \times 10^4$$

$$\text{Germany} = \frac{\$1.8393 \times 10^{12}}{8.2061 \times 10^7} = \$2.24 \times 10^4$$

$$\text{Ireland} = \frac{\$7.13 \times 10^{10}}{3.661 \times 10^6} = \$1.95 \times 10^4$$

$$\text{Luxembourg} = \frac{\$1.36 \times 10^{10}}{4.2 \times 10^5} = \$3.24 \times 10^4$$

$$\text{The Netherlands} = \frac{\$3.334 \times 10^{11}}{1.56 \times 10^7} = \$2.14 \times 10^4$$

$$\text{Sweden} = \frac{\$1.773 \times 10^{11}}{8.849 \times 10^6} = 2.00 \times 10^4$$

$$54. \frac{4.56 \times 10^{-2} \text{ cm}}{7.5 \times 10^{-4} \text{ cm}} = 6.08 \times 10^1 \text{ cm}$$

$$55. \frac{1.04 \times 10^{10} \text{ km}}{1.39 \times 10^6 \text{ km/day}} = 7.48 \times 10^3 \text{ days}$$

$$56. (1.2 \times 10^7 \text{ birds/species})(8.6 \times 10^3 \text{ species}) = 1.03 \times 10^{11} \text{ birds}$$

57. a.; b.

State	Total Area (acres)	Amount of park space	Park space/Total area
Alaska	$3.937472 \times 10^8$	$3.25 \times 10^6$	$8.25 \times 10^{-3}$
California	$1.01676 \times 10^8$	$1.345 \times 10^6$	$1.32 \times 10^{-2}$
Connecticut	$3.548 \times 10^6$	$1.76 \times 10^5$	$4.96 \times 10^{-2}$
Kansas	$5.26 \times 10^7$	$2.9 \times 10^4$	$5.51 \times 10^{-4}$
Ohio	$2.869 \times 10^7$	$2.04 \times 10^5$	$7.11 \times 10^{-3}$
Pennsylvania	$2.9477 \times 10^7$	$2.83 \times 10^5$	$9.60 \times 10^{-3}$

c. A good answer should include the percent of area in the state that is now park land, it should also include comparisons with the percents in other states.

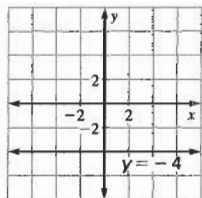
$$58. \frac{a^0}{a^m} = a^{0-m} = a^{-m}$$

$$59. a^m \cdot a^{-n} = a^{m+(-n)} = a^{m-n} = \frac{a^m}{a^n}$$

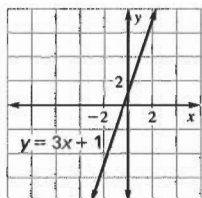
# Chapter 6 continued

## 6.1 Mixed Review (p. 328)

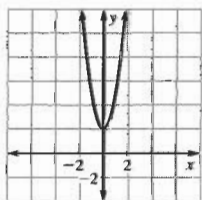
60.  $y = -4$



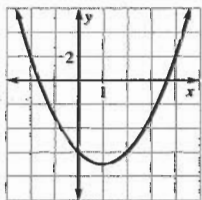
62.  $y = 3x + 1$



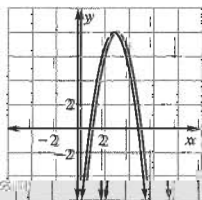
64.  $y = 3x^2 + 2$



66.  $y = x^2 - 2x - 6$



68.  $y = -2(x - 3)^2 + 8$



70.  $-3x^2 = -24$

$$x^2 = 8$$

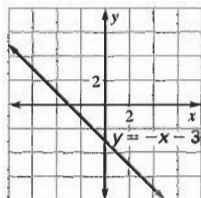
$$x = \pm 2\sqrt{2}$$

72.  $3x^2 = 108$

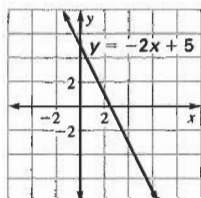
$$x^2 = 36$$

$$x = \pm 6$$

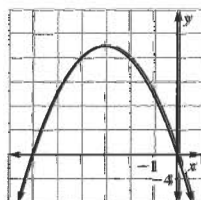
61.  $y = -x - 3$



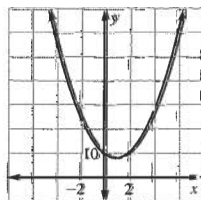
63.  $y = -2x + 5$



65.  $y = -2x(x + 6)$



67.  $y = 2x^2 - 4x + 10$



69.  $2x^2 = 32$

$$x^2 = 16$$

$$x = \pm 4$$

71.  $25x^2 = 16$

$$x^2 = \frac{16}{25}$$

$$x = \pm \frac{4}{5}$$

73.  $5x^2 = 5$

$$x^2 = 1$$

$$x = \pm 1$$

74.  $4x^2 = 14$

$$x^2 = \frac{14}{4}$$

$$x = \pm \frac{\sqrt{14}}{2}$$

76.  $3x^2 = 20$

$$x^2 = \frac{20}{3}$$

$$x = \pm \frac{2\sqrt{15}}{3}$$

78.  $18 + 3i$     79.  $-3 + 4i$     80.  $6 - 8i$

81.  $-7i + 2 = 2 - 7i$     82.  $11 - 55i$

83.  $(27 - 1) + (9i + 3i) = 26 + 12i$

75.  $3x^2 = 15$

$$x^2 = 5$$

$$x = \pm \sqrt{5}$$

77.  $3x^2 = 9$

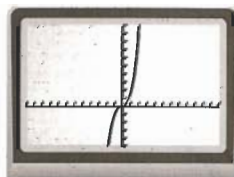
$$x^2 = 3$$

$$x = \pm \sqrt{3}$$

## Lesson 6.2

### Activity (p. 331)

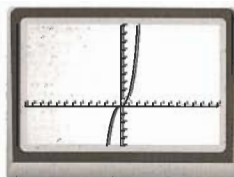
1. a.  $y = x^3$



$$f(x) \rightarrow -\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow +\infty \text{ as } x \rightarrow +\infty$$

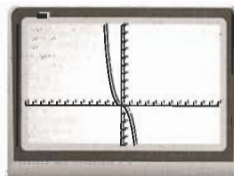
c.  $y = x^5$



$$f(x) \rightarrow -\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow +\infty \text{ as } x \rightarrow +\infty$$

e.  $y = -x^3$



$$f(x) \rightarrow +\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow -\infty \text{ as } x \rightarrow +\infty$$

b.  $y = x^4$



$$f(x) \rightarrow +\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow +\infty \text{ as } x \rightarrow +\infty$$

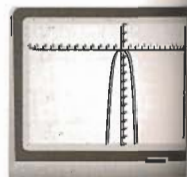
d.  $y = x^6$



$$f(x) \rightarrow +\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow +\infty \text{ as } x \rightarrow +\infty$$

f.  $y = -x^4$



$$f(x) \rightarrow -\infty \text{ as } x \rightarrow -\infty$$

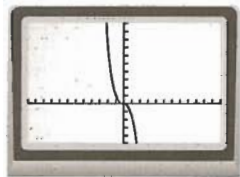
$$f(x) \rightarrow -\infty \text{ as } x \rightarrow +\infty$$

—CONTINUED—

## Chapter 6 continued

### 1. —CONTINUED—

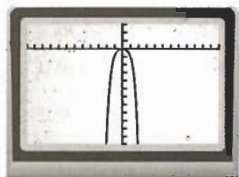
g.  $y = -x^5$



$$f(x) \rightarrow +\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow -\infty \text{ as } x \rightarrow +\infty$$

h.  $y = -x^6$



$$f(x) \rightarrow -\infty \text{ as } x \rightarrow -\infty$$

$$f(x) \rightarrow -\infty \text{ as } x \rightarrow +\infty$$

- If the leading coefficient is positive, the values of the function approach  $+\infty$ ; if the leading coefficient is negative, the values of the function approach  $-\infty$ .
- When the function's degree is odd, the ends will go in opposite directions. When the function's degree is even, the ends will go in the same direction.

### 6.2 Guided Practice (p. 333)

1. 3, cubic,  $-2$ ,  $0$     2.  $-2$

$$\begin{array}{ccc|ccc} 3 & 1 & -9 & 2 & & \\ & -6 & 10 & -2 & & \\ \hline 3 & -5 & 1 & 0 & & \end{array}$$

3. horizontal line

4.  $-1$   $\begin{array}{ccc|ccc} \sqrt{5} & 0 & 0 & 0 & 0 & \\ & -\sqrt{5} & \sqrt{5} & -\sqrt{5} & \sqrt{5} & \\ \hline \sqrt{5} & -\sqrt{5} & \sqrt{5} & -\sqrt{5} & \sqrt{5} & \end{array}$     5. no    6. no

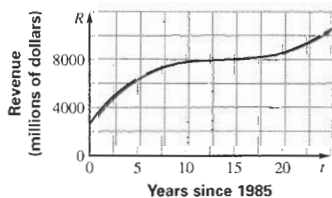
yes;  $\sqrt{5} + 1$

7.  $-1$   $\begin{array}{ccc|ccc} 5 & 0 & -21 & 0 & 14 & \\ & -5 & 5 & 16 & -16 & \\ \hline 5 & -5 & -16 & 16 & -2 & \end{array}$

yes;  $-2$

- $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$
- $f(x) \rightarrow +\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$
- $f(x) \rightarrow +\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$
- $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$
- $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$
- $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$
- $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$

14. Total Revenue from Home Video Rentals



### 6.2 Practice and Applications (pp. 333–336)

- yes;  $f(x) = -5x + 12$ ; 1; linear;  $-5$
- yes;  $f(x) = \frac{3}{5}x^4 + 2x + 9$ ; 4; quartic;  $\frac{3}{5}$
- yes;  $f(x) = x + \pi$ ; 1; linear; 1
- yes;  $f(x) = x^2\sqrt{2} + x - 5$ ; 2; quadratic;  $\sqrt{2}$
- no
- yes;  $f(x) = -2$ ; 0; constant;  $-2$
- yes;  $f(x) = x^2 - x + 1$ ; 2; quadratic; 1
- no
- yes;  $f(x) = x^4 - x^3 + 36x^2$ ; 4; quartic; 1
- no
- yes;  $f(x) = 3x^3$ ; 3; cubic; 3
- no
- $f(-2) = 2(-2)^3 + 5(-2)^2 + 4(-2) + 8$   
 $= -16 + 20 - 8 + 8$   
 $= 4$
- $f(3) = 2(3)^3 - (3)^4 + 5(3)^2 - 3$   
 $= 54 - 81 + 45 - 3$   
 $= 15$
- $f(4) = 4 + \frac{1}{2}(4)^3$     30.  $f(-1) = (-1)^2 - (-1)^5 + 1$   
 $= 4 + 32$      $= 1 + 1 + 1$   
 $= 36$      $= 3$
- $f(1) = 5(1)^4 - 8(1)^3 + 7(1)^2$   
 $= 5 - 8 + 7$   
 $= 4$
- $f(-3) = (-3)^3 + 3(-3)^2 - 2(-3) + 5$   
 $= -27 + 27 + 6 + 5$   
 $= 11$
- $f(0) = 11(0)^3 - 6(0)^2 + 2$     34.  $f(2) = (2)^4 - 2(2) + 7$   
 $= 0 + 0 + 2$      $= 16 - 4 + 7$   
 $= 2$      $= 19$
- $f(10) = 7(10)^3 + 9(10)^2 + 3(10)$   
 $= 7000 + 900 + 30$   
 $= 7930$
- $f(-2) = -(-2)^5 - 4(-2)^3 + 6(-2)^2 - (-2)$   
 $= 32 + 32 + 24 + 2$   
 $= 90$

## Chapter 6 continued

$$37. \begin{array}{c} 2 \\ \hline \begin{array}{ccc|c} 5 & 4 & 8 & 1 \\ & 10 & 28 & 72 \end{array} \\ \hline 5 \quad 14 \quad 36 \quad 73 \end{array}$$

$$38. \begin{array}{c} 3 \\ \hline \begin{array}{ccc|c} -3 & 7 & -4 & 8 \\ & -9 & -6 & -30 \end{array} \\ \hline -3 \quad -2 \quad -10 \quad -22 \end{array}$$

$$39. \begin{array}{c} -5 \\ \hline \begin{array}{ccc|c} 1 & 3 & 6 & -11 \\ & -5 & 10 & -80 \end{array} \\ \hline 1 \quad -2 \quad 16 \quad -91 \end{array}$$

$$40. \begin{array}{c} -1 \\ \hline \begin{array}{ccc|c} 1 & -1 & 12 & 15 \\ & -1 & 2 & -14 \end{array} \\ \hline 1 \quad -2 \quad 14 \quad 1 \end{array}$$

$$41. \begin{array}{c} 2 \\ \hline \begin{array}{ccc|c} -4 & 0 & 3 & -5 \\ & -8 & -16 & -26 \end{array} \\ \hline -4 \quad -8 \quad -13 \quad -31 \end{array}$$

$$42. \begin{array}{c} -3 \\ \hline \begin{array}{cccc|c} -1 & 1 & 0 & -1 & 1 \\ & 3 & -12 & 36 & -105 \end{array} \\ \hline -1 \quad 4 \quad -12 \quad 35 \quad -104 \end{array}$$

$$43. \begin{array}{c} -1 \\ \hline \begin{array}{ccc|c} 2 & 1 & -3 & 5 & 0 \\ & -2 & 1 & 2 & -7 \end{array} \\ \hline 2 \quad -1 \quad -2 \quad 7 \quad -7 \end{array}$$

$$44. \begin{array}{c} 2 \\ \hline \begin{array}{cccc|c} 3 & 0 & 0 & -2 & 1 & 0 \\ & 6 & 12 & 24 & 44 & 90 \end{array} \\ \hline 3 \quad 6 \quad 12 \quad 22 \quad 45 \quad 90 \end{array}$$

$$45. \begin{array}{c} 5 \\ \hline \begin{array}{ccc|c} 2 & -1 & 6 & 0 \\ & 10 & 45 & 255 \end{array} \\ \hline 2 \quad 9 \quad 51 \quad 255 \end{array}$$

$$46. \begin{array}{c} -2 \\ \hline \begin{array}{ccc|c} -1 & 8 & 0 & 13 & -4 \\ & 2 & -20 & 40 & -106 \end{array} \\ \hline -1 \quad 10 \quad -20 \quad 53 \quad -110 \end{array}$$

Function	as $x \rightarrow -\infty$	as $x \rightarrow +\infty$
$f(x) = -5x^3$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow -\infty$
$f(x) = -x^3 + 1$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow -\infty$
$f(x) = 2x - 3x^3$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow -\infty$
$f(x) = 2x^2 - x^3$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow -\infty$

Function	as $x \rightarrow -\infty$	as $x \rightarrow +\infty$
$f(x) = x^4 + 3x^3$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow +\infty$
$f(x) = x^4 + 2$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow +\infty$
$f(x) = x^4 - 2x - 1$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow +\infty$
$f(x) = 3x^4 - 5x^2$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow +\infty$

49. C 50. D 51. B 52. A

53.  $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$

54.  $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$

55.  $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$

56.  $f(x) \rightarrow +\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$

57.  $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$

58.  $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$

59.  $f(x) \rightarrow +\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$

60.  $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$

61.  $f(x) \rightarrow +\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$

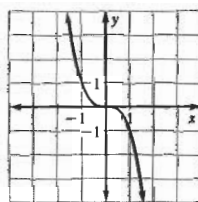
62.  $f(x) \rightarrow +\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$

63.  $f(x) \rightarrow +\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$

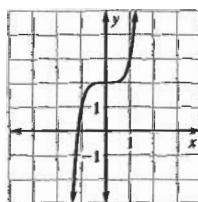
64.  $f(x) \rightarrow +\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$

65.  $f(x) = -x^3$

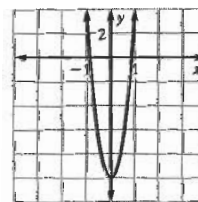
66.  $f(x) = -x^4$



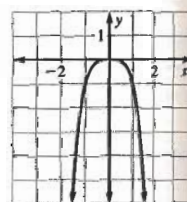
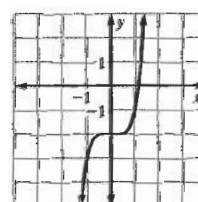
67.  $f(x) = x^5 + 2$



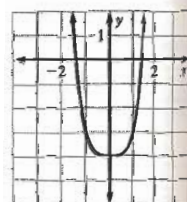
69.  $f(x) = x^4 + 6x^2 - 5$



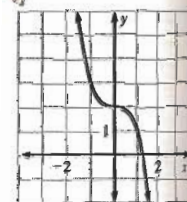
71.  $f(x) = x^5 - 2$



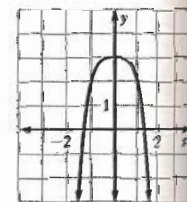
68.  $f(x) = x^4 - 4$



70.  $f(x) = 2 - x^3$

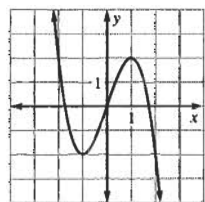


72.  $f(x) = -x^4 + 3$

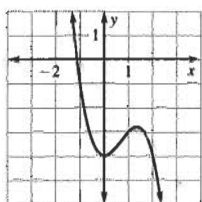


# Chapter 6 continued

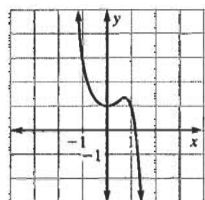
73.  $f(x) = -x^3 + 3x$



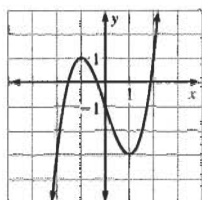
74.  $f(x) = -x^3 + 2x^2 - 4$



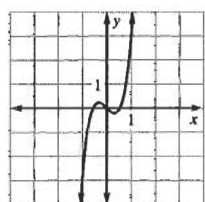
75.  $f(x) = -x^5 + x^2 + 1$



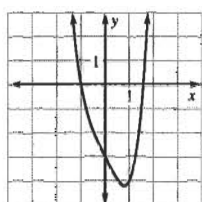
76.  $f(x) = x^3 - 3x - 1$



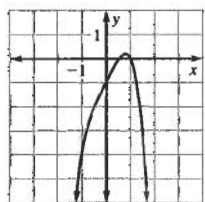
77.  $f(x) = x^5 + 3x^3 - x$



78.  $f(x) = x^4 - 2x - 3$



79.  $f(x) = -x^4 + 2x - 1$



80. *Sample answer:* Any polynomial function of odd degree that has a positive leading coefficient will work;  
 $f(x) = 4x^3$

81.  $S = -0.0068(18)^3 - 0.27(18)^2 + 150(18) + 1700$   
 $S = 4272.9$   
 about 4272.9 million ft<sup>2</sup>

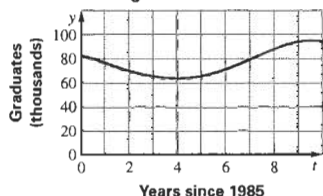
82.  $R = -0.0036(3)^3 + 0.13(3)^2 - 0.073(3) + 7.7$   
 $R = 8.55$   
 about \$8.55

83.  $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow -\infty$  as  $x \rightarrow +\infty$ ;  
 less; the graph will go down over time

84.  $y = -0.036t^4 + 0.605t^3 - 1.87t^2 - 4.67t + 82.5$

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85.  $f(x) \rightarrow +\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$ ;  
 more; the graph will go up over time

86.  $P = 1.141t^2 - 5.837t + 14.31$

about \$1,208,000



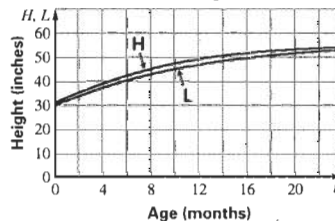
87. a.  $L = 0.0007(18)^3 - 0.061(18)^2 + 2.02(18) + 30$   
 $L = 50.7$

$H = 0.001(18)^3 - 0.08(18)^2 + 2.3(18) + 31$   
 $H = 52.3$

Normal range would be 50.7 in. to 52.3 in.

b.  $f(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$  and  $f(x) \rightarrow +\infty$  as  $x \rightarrow +\infty$ ;  
 more; the graph will go up over time

c. Heifer Minimum/Maximum Normal Height



d. *Sample answer:* The calf is probably around 7 months old. I got this by using the graph in part c. I found the height and looked down to find how old the calf was.

88.

$x$	$f(x)$	$g(x)$	$\frac{f(x)}{g(x)}$
50	125,000	120,205	1.03989
100	1,000,000	980,405	1.01999
500	$1.25 \times 10^8$	124,502,005	1.004
1000	$10^9$	998,004,005	1.002
5000	$1.25 \times 10^{11}$	$1.2495 \times 10^{11}$	1.0004

89. 1; Eventually the combined values of the terms after the leading term will be negligible compared to the value of the leading terms.

## 6.2 Mixed Review (p. 336)

90.  $-2x + 5$  91.  $7x$  92.  $-4x^2 - 1$  93.  $x^2 + 4x - 11$

94.  $-3x^2 + 4x - 1$  95.  $-x^2 - x + 2$

96.  $y = -4x^2 + 16x - 11$  97.  $y = -2x^2 - 2x + 60$

98.  $y = 2x^2 - 6x - 56$  99.  $y = 4x^2 - 24x + 12$

## Chapter 6 continued

100.  $y = -x^2 - 10x - 13$  101.  $y = -3x^2 + 30x - 72$   
 102.  $x = \pm 3i$  103.  $x = \pm i\sqrt{5}$  104.  $x = \pm i\sqrt{2}$   
 105.  $x = \pm i\sqrt{3}$  106.  $x = \pm i$  107.  $x = \pm i\frac{\sqrt{6}}{6}$   
 108.  $x = \pm i\sqrt{5}$  109.  $x = \pm i\frac{\sqrt{10}}{2}$  110.  $x = \pm i\frac{\sqrt{7}}{7}$

### Developing Concepts Activity 6.2 (p. 337)

- $-10 \leq x \leq 10, -10 \leq y \leq 100$
- $-10 \leq x \leq 30, 0 \leq y \leq 3000$
- $-5 \leq x \leq 5, -5 \leq y \leq 10$
- $-5 \leq x \leq 5, -5 \leq y \leq 30$
- $-5 \leq x \leq 5, 0 \leq y \leq 20$
- $0 \leq x \leq 5, -5 \leq y \leq 5$
- $0 \leq x \leq 15, 0 \leq y \leq 300,000$

### Lesson 6.3

#### 6.3 Guided Practice (p. 341)

- like terms
- The negative sign was not distributed over all of the second polynomial.
- 6 4.  $7x^2 + 11$  5.  $2x^3 - 5x^2 - 3x + 6$
- $(x^2 + 7x - 5) - (3x^2 + 1) = -2x^2 + 7x - 6$
- $(x^2 + 1) - (3x^2 - 4x + 3) = x^2 + 1 - 3x^2 + 4x - 3 = -2x^2 + 4x - 2$
- $(x + 2)(2x^2 + 3) = 2x^3 + 3x + 4x^2 + 6 = 2x^3 + 4x^2 + 3x + 6$
- $(x^2 + 3x + 10)(4x^2 - 2x - 7) = x^2(4x^2 - 2x - 7) + 3x(4x^2 - 2x - 7) + 10(4x^2 - 2x - 7) = 4x^4 - 2x^3 - 7x^2 + 12x^3 - 6x^2 - 21x + 40x^2 - 20x - 70 = 4x^4 + 10x^3 + 27x^2 - 41x - 70$
- $(x - 1)(2x + 1)(x + 5) = (2x^2 - x - 1)(x + 5) = x(2x^2 - x - 1) + 5(2x^2 - x - 1) = 2x^3 - x^2 - x + 10x^2 - 5x - 5 = 2x^3 + 9x^2 - 6x - 5$
- $(-3x + 1)(-3x + 1)(-3x + 1) = (9x^2 - 6x + 1)(-3x + 1) = -3x(9x^2 - 6x + 1) + (9x^2 - 6x + 1) = -27x^3 + 18x^2 - 3x + 9x^2 - 6x + 1 = -27x^3 + 27x^2 - 9x + 1$

12.  $V = (x + 3)(x - 3)(x - 2) = (x^2 - 9)(x - 2) = x(x^2 - 9) - 2(x^2 - 9) = x^3 - 9x - 2x^2 + 18 = x^3 - 2x^2 - 9x + 18$

#### 6.3 Practice and Applications (pp. 341–343)

- $(8x^2 + 1) + (3x^2 - 2) = 11x^2 - 1$
- $3x^3 + 10x + 5 - x^3 + 4x - 6 = 2x^3 + 14x - 1$
- $x^2 - 6x + 5 - x^2 - x + 2 = -7x + 7$
- $16 - 13x + 10x - 11 = -3x + 5$
- $7x^3 - 1 - 15x^3 - 4x^2 + x - 3 = -8x^3 - 4x^2 + x - 4$
- $8x + 14x + 3 - 41x^2 + x^3 = x^3 - 41x^2 + 22x + 3$
- $4x^2 - 11x + 10 + 5x - 31 = 4x^2 - 6x - 21$
- $9x^3 - 4 + x^2 + 8x - 7x^3 + 3x - 7 = 2x^3 + x^2 + 11x - 11$
- $-3x^3 + x - 11 - 4x^3 - x^2 + x = -7x^3 - x^2 + 2x - 11$
- $6x^2 - 19x + 5 - 19x^2 + 4x - 9 = -13x^2 - 15x - 4$
- $10x^3 - 4x^2 + 3x - x^3 + x^2 - 1 = 9x^3 - 3x^2 + 3x - 1$
- $50x - 3 + 8x^3 + 7x^2 + x + 4 = 8x^3 + 7x^2 + 51x + 1$
- $10x - 3 + 7x^2 + x^3 - 2x + 17 = x^3 + 7x^2 + 8x + 14$
- $3x^3 - 5x^4 - 10x + 1 + 17x^4 - x^3 = 12x^4 + 2x^3 - 10x + 1$
- $x(x^2 + 6x - 7) = x^3 + 6x^2 - 7x$
- $10x^2(x - 5) = 10x^3 - 50x^2$
- $-4x(x^2 - 8x + 3) = -4x^3 + 32x^2 - 12x$
- $5x(3x^2 - x + 3) = 15x^3 - 5x^2 + 15x$
- $(x - 4)(x - 7) = x^2 - 11x + 28$
- $(x + 9)(x - 2) = x^2 + 7x - 18$
- $(x + 3)(x^2 - 4x + 9) = x(x^2 - 4x + 9) + 3(x^2 - 4x + 9) = x^3 - 4x^2 + 9x + 3x^2 - 12x + 27 = x^3 - x^2 - 3x + 27$
- $(x + 8)(x^2 - 7x - 3) = x(x^2 - 7x - 3) + 8(x^2 - 7x - 3) = x^3 - 7x^2 - 3x + 8x^2 - 56x - 24 = x^3 + x^2 - 59x - 24$

## Chapter 6 continued

35.  $(2x + 5)(3x^3 - x^2 + x)$   
 $= 2x(3x^3 - x^2 + x) + 5(3x^3 - x^2 + x)$   
 $= 6x^4 - 2x^3 + 2x^2 + 15x^3 - 5x^2 + 5x$   
 $= 6x^4 + 13x^3 - 3x^2 + 5x$
36.  $(6x + 2)(2x^2 - 6x + 1)$   
 $= 6x(2x^2 - 6x + 1) + 2(2x^2 - 6x + 1)$   
 $= 12x^3 - 36x^2 + 6x + 4x^2 - 12x + 2$   
 $= 12x^3 - 32x^2 - 6x + 2$
37.  $(x + 11)(x^2 - 5x + 9)$   
 $= x(x^2 - 5x + 9) + 11(x^2 - 5x + 9)$   
 $= x^3 - 5x^2 + 9x + 11x^2 - 55x + 99$   
 $= x^3 + 6x^2 - 46x + 99$
38.  $(4x^2 - 1)(x^2 - 6x + 9)$   
 $= 4x^2(x^2 - 6x + 9) - 1(x^2 - 6x + 9)$   
 $= 4x^4 - 24x^3 + 36x^2 - x^2 + 6x - 9$   
 $= 4x^4 - 24x^3 + 35x^2 + 6x - 9$
39.  $(x - 1)(x^3 + 2x^2 + 2)$   
 $= x(x^3 + 2x^2 + 2) - (x^3 + 2x^2 + 2)$   
 $= x^4 + 2x^3 + 2x - x^3 - 2x^2 - 2$   
 $= x^4 + x^3 - 2x^2 + 2x - 2$
40.  $(x + 1)(5x^3 - x^2 + x - 4)$   
 $= x(5x^3 - x^2 + x - 4) + (5x^3 - x^2 + x - 4)$   
 $= 5x^4 - x^3 + x^2 - 4x + 5x^3 - x^2 + x - 4$   
 $= 5x^4 + 4x^3 - 3x - 4$
41.  $(3x^2 - 2)(x^2 + 4x + 3)$   
 $= 3x^2(x^2 + 4x + 3) - 2(x^2 + 4x + 3)$   
 $= 3x^4 + 12x^3 + 9x^2 - 2x^2 - 8x - 6$   
 $= 3x^4 + 12x^3 + 7x^2 - 8x - 6$
42.  $(-x^3 - 2)(x^2 + 3x - 3)$   
 $= -x^3(x^2 + 3x - 3) - 2(x^2 + 3x - 3)$   
 $= -x^5 - 3x^4 + 3x^3 - 2x^2 - 6x + 6$
43.  $(x^2 + x + 4)(2x^2 - x + 1)$   
 $= x^2(2x^2 - x + 1) + x(2x^2 - x + 1) + 4(2x^2 - x + 1)$   
 $= 2x^4 - x^3 + x^2 + 2x^3 - x^2 + x + 8x^2 - 4x + 4$   
 $= 2x^4 + x^3 + 8x^2 - 3x + 4$
44.  $(x^2 - x - 3)(x^2 + 4x + 2)$   
 $= x^2(x^2 + 4x + 2) - x(x^2 + 4x + 2) - 3(x^2 + 4x + 2)$   
 $= x^4 + 4x^3 + 2x^2 - x^3 - 4x^2 - 2x - 3x^2 - 12x - 6$   
 $= x^4 + 3x^3 - 5x^2 - 14x - 6$
45.  $(x + 9)(x - 2)(x - 7)$   
 $= (x^2 + 7x - 18)(x - 7)$   
 $= x(x^2 + 7x - 18) - 7(x^2 + 7x - 18)$   
 $= x^3 + 7x^2 - 18x - 7x^2 - 49x + 126$   
 $= x^3 - 67x + 126$
46.  $(x + 3)(x - 4)(x - 5)$   
 $= (x^2 - x - 12)(x - 5)$   
 $= x(x^2 - x - 12) - 5(x^2 - x - 12)$   
 $= x^3 - x^2 - 12x - 5x^2 + 5x + 60$   
 $= x^3 - 6x^2 - 7x + 60$
47.  $(x + 5)(x + 7)(-x + 1)$   
 $= (x^2 + 12x + 35)(-x + 1)$   
 $= -x(x^2 + 12x + 35) + (x^2 + 12x + 35)$   
 $= -x^3 - 12x^2 - 35x + x^2 + 12x + 35$   
 $= -x^3 - 11x^2 - 23x + 35$
48.  $(2x - 3)(x^2 + 13x + 42)$   
 $= 2x(x^2 + 13x + 42) - 3(x^2 + 13x + 42)$   
 $= 2x^3 + 26x^2 + 84x - 3x^2 - 39x - 126$   
 $= 2x^3 + 23x^2 + 45x - 126$
49.  $(x - 9)(x - 2)(3x + 2)$   
 $= (x^2 - 11x + 18)(3x + 2)$   
 $= 3x(x^2 - 11x + 18) + 2(x^2 - 11x + 18)$   
 $= 3x^3 - 33x^2 + 54x + 2x^2 - 22x + 36$   
 $= 3x^3 - 31x^2 + 32x + 36$
50.  $(x - 1)(x - 8)(-2x - 5)$   
 $= (x^2 - 9x + 8)(-2x - 5)$   
 $= -2x(x^2 - 9x + 8) - 5(x^2 - 9x + 8)$   
 $= -2x^3 + 18x^2 - 16x - 5x^2 + 45x - 40$   
 $= -2x^3 + 13x^2 + 29x - 40$
51.  $(2x + 1)(3x + 1)(x + 4)$   
 $= (2x + 1)(3x^2 + 13x + 4)$   
 $= 2x(3x^2 + 13x + 4) + (3x^2 + 13x + 4)$   
 $= 6x^3 + 26x^2 + 8x + 3x^2 + 13x + 4$   
 $= 6x^3 + 29x^2 + 21x + 4$
52.  $(4x - 1)(2x - 1)(3x - 2)$   
 $= (8x^2 - 6x + 1)(3x - 2)$   
 $= 3x(8x^2 - 6x + 1) - 2(8x^2 - 6x + 1)$   
 $= 24x^3 - 18x^2 + 3x - 16x^2 + 12x - 2$   
 $= 24x^3 - 34x^2 + 15x - 2$



## Chapter 6 continued

53.  $(x + 7)(x - 7) = x^2 + 7x - 7x - 49 = x^2 - 49$
54.  $(x + 4)(x + 4) = x^2 + 4x + 4x + 16 = x^2 + 8x + 16$
55.  $(4x - 3)(4x - 3)(4x - 3)$   
 $= (16x^2 - 24x + 9)(4x - 3)$   
 $= 4x(16x^2 - 24x + 9) - 3(16x^2 - 24x + 9)$   
 $= 64x^3 - 96x^2 + 36x - 48x^2 + 72x - 27$   
 $= 64x^3 - 144x^2 + 108x - 27$
56.  $(10x + 3)(10x - 3) = 100x^2 - 30x + 30x - 9$   
 $= 100x^2 - 9$
57.  $(6 - x^2)(6 - x^2) = 36 - 6x^2 - 6x^2 + x^4$   
 $= 36 - 12x^2 + x^4$
58.  $(2y + 5x)(2y + 5x) = 4y^2 + 10xy + 10xy + 25x^2$   
 $= 4y^2 + 20xy + 25x^2$
59.  $(3x + 7)(3x + 7)(3x + 7)$   
 $= (3x + 7)(9x^2 + 42x + 49)$   
 $= 3x(9x^2 + 42x + 49) + 7(9x^2 + 42x + 49)$   
 $= 27x^3 + 126x^2 + 147x + 63x^2 + 294x + 343$   
 $= 27x^3 + 189x^2 + 441x + 343$
60.  $(7y - x)(7y - x) = 49y^2 - 7xy - 7xy + x^2$   
 $= 49y^2 - 14xy + x^2$
61.  $(2x + 3y)(2x + 3y)(2x + 3y)$   
 $= (2x + 3y)(4x^2 + 12xy + 9y^2)$   
 $= 2x(4x^2 + 12xy + 9y^2) + 3y(4x^2 + 12xy + 9y^2)$   
 $= 8x^3 + 24x^2y + 18xy^2 + 12x^2y + 36xy^2 + 27y^3$   
 $= 8x^3 + 36x^2y + 54xy^2 + 27y^3$
62.  $V = \pi(x - 2)^2(x + 3)$   
 $= \pi[(x^2 - 4x + 4)(x + 3)]$   
 $= \pi[x(x^2 - 4x + 4) + 3(x^2 - 4x + 4)]$   
 $= \pi[x^3 - 4x^2 + 4x + 3x^2 - 12x + 12]$   
 $= \pi[x^3 - x^2 - 8x + 12]$   
 $= \pi x^3 - \pi x^2 - 8\pi x + 12\pi$
63.  $V = (2x + 3)(x)(x + 1)$   
 $= (2x^2 + 3x)(x + 1)$   
 $= x(2x^2 + 3x) + (2x^2 + 3x)$   
 $= 2x^3 + 3x^2 + 2x^2 + 3x$   
 $= 2x^3 + 5x^2 + 3x$
64.  $C = -1.63t^4 + 49.5t^3 - 476t^2 + 1370t + 6705$   
 $T = -1.052t^4 + 31.6t^3 - 296t^2 + 1097t + 2290$   
 $V = -2.682t^4 + 81.1t^3 - 772t^2 + 2467t + 8995$   
 $= -2.682(7)^4 + 81.1(7)^3 - 772(7)^2 + 2467(7) + 8995$   
 $\approx 9814$   
 about 9,813,818 total vehicles

65.  $P - S = Y$   
 $P = -0.804t^4 + 26.9t^3 - 262t^2 + 3010t + 227,000$   
 $S = 0.0206t^4 - 0.67t^3 + 6.42t^2 + 213t + 7740$   
 $Y = -0.8246t^4 + 27.57t^3 - 268.42t^2 + 2797t + 219,260$   
 $= -0.8246(15)^4 + 27.57(15)^3 - 268.42(15)^2$   
 $+ 2797(15) + 219,260$   
 $\approx 252$   
 about 252 million people
66.  $P = 0.00267s(0.0116s^2 + 0.789)$   
 $= 0.000030972s^3 + .00210663s$   
 $= 0.000030972(10)^3 + .00210663(10)$   
 $= 0.030972 + 0.0210663$   
 $= 0.0520383$   
 about 0.05 horsepower
67.  $P \times D = W \times 100$   
 $= (0.43t + 49)(-0.096t^4 + 3t^3 - 27t^2 + 91t + 1700)$   
 $= 0.04128t^5 + 1.29t^4 - 11.61t^3 + 39.13t^2 + 731$   
 $- 4.704t^4 + 147t^3 - 1323t^2 + 4459t + 83300$   
 $= -0.04128t^5 - 3.414t^4 + 135.39t^3 - 1283.87t^2$   
 $+ 5190t + 83300$   
 $W = -0.0004128t^5 - 0.03414t^4 + 1.3539t^3 - 12.8387t^2$   
 $+ 51.9t + 833$   
 $t = 11$   
 $W = -0.0004128(11)^5 - 0.03414(11)^4 + 1.3539(11)^3$   
 $- 12.8387(11)^2 + 51.9(11) + 833$   
 $\approx 1,086$   
 about 1,086,000 degrees
68.  $R = N \times P$   
 $R = 0.67t(-0.27t^3 + 3.9t^2 + 7.9t + 650)$   
 $+ 9.4(-0.27t^3 + 3.9t^2 + 7.9t + 650)$   
 $R = -0.1809t^4 + 2.613t^3 + 5.293t^2 + 435.5t$   
 $- 2.538t^3 + 36.66t^2 + 74.26t + 6110$   
 $R = -0.1809t^4 + 0.075t^3 + 41.953t^2 + 509.76t + 6110$   
 $t = 6$   
 $R = -0.1809(6)^4 + 0.075(6)^3 + 41.953(6)^2$   
 $+ 509.76(6) + 6110$   
 $R \approx 10,461$   
 about \$10,461 million

## Chapter 6 continued

$$\begin{aligned}
 69. I &= 4000(1+r)^3 + 5000(1+r)^2 + 7000(1+r) \\
 &= 4000(1+3r+3r^2+r^3) + 5000(1+2r+r^2) \\
 &\quad + 7000(1+r) \\
 &= 1(16,000) + r(29,000) + r^2(17,000) + r^3(4000) \\
 m &= 6000(1+3r+3r^2+r^3) + 800(1+2r+r^2) \\
 &\quad + 9000(1+r) \\
 &= (23,000) + r(43,000) + r^2(26,000) + r^3(6,000) \\
 T + M &= 39,000 + 72,000r + 43,000r^2 + 10,000r^3
 \end{aligned}$$

$$\begin{aligned}
 70. 2x^4 + 5x^3 - 8x^2 - x + 10 + 8x^4 - 4x^3 + x^2 - x + 2 \\
 = 10x^4 + x^3 - 7x^2 - 2x + 12
 \end{aligned}$$

C

$$\begin{aligned}
 71. (3x-8)(3x-8)(3x-8) \\
 = (9x^2 - 48x + 64)(3x-8) \\
 = 3x(9x^2 - 48x + 64) - 8(9x^2 - 48x + 64) \\
 = 27x^3 - 144x^2 + 192x - 72x^2 + 384 - 512 \\
 = 27x^3 - 216x^2 + 576x - 512
 \end{aligned}$$

A

$$\begin{aligned}
 72. \text{a. } (x^5 - 1) &= (x-1)(x^4 + x^3 + x^2 + x + 1) \\
 (x^6 - 1) &= (x-1)(x^5 + x^4 + x^3 + x^2 + x + 1) \\
 \text{b. } x^n - 1 &= (x-1)(x^{n-1} + x^{n-2} + x^{n-3} + \dots \\
 &\quad + x + 1)
 \end{aligned}$$

Multiply:

$$x(x^{n-1}) - (x^{n-1}) + (x)(x^{n-2}) - (x^{n-2}) + \dots - 1$$

Pairs of middle terms will cancel out.

### 6.3 Mixed Review (p. 344)

$$\begin{aligned}
 73. 4x^2 &= 36 \\
 x^2 &= 9 \\
 x &= \pm 3
 \end{aligned}$$

$$\begin{aligned}
 74. (x+8)(x-5) &= 0 \\
 x &= -8 \text{ or } x = 5
 \end{aligned}$$

$$\begin{aligned}
 75. x^2 + 16x + 64 &= 0 \\
 (x+8)(x+8) &= 0 \\
 x &= -8
 \end{aligned}$$

$$\begin{aligned}
 76. x^2 - x - 56 &= 0 \\
 (x-8)(x+7) &= 0 \\
 x &= 8 \text{ or } x = -7
 \end{aligned}$$

$$\begin{aligned}
 77. (2x+3)(x-5) &= 0 \\
 x &= -\frac{3}{2} \text{ or } x = 5
 \end{aligned}$$

$$\begin{aligned}
 78. 2(3x^2 + 5x - 2) &= 0 \\
 2(3x-1)(x+2) &= 0 \\
 x &= \frac{1}{3} \text{ or } x = -2
 \end{aligned}$$

$$\begin{aligned}
 79. 16a - 4b + c &= 0 \\
 4a + 2b + c &= 0 \\
 a + b + c &= 6 \\
 y &= -\frac{6}{5}x^2 - \frac{12}{5}x + \frac{48}{5}
 \end{aligned}$$

$$\begin{aligned}
 80. 100a + 10b + c &= 0 \\
 a + b + c &= 0 \\
 16a + 4b + c &= 3 \\
 y &= -\frac{1}{6}x^2 + \frac{11}{6}x - \frac{5}{3}
 \end{aligned}$$

$$\begin{aligned}
 81. 36a - 6b + c &= 0 \\
 36a + 6b + c &= 0 \\
 9a - 3b + c &= -9 \\
 y &= \frac{1}{3}x^2 - 12
 \end{aligned}$$

$$\begin{aligned}
 82. 9a - 3b + c &= 0 \\
 25a + 5b + c &= 0 \\
 4a - 2b + c &= 7 \\
 y &= -x^2 + 2x + 15
 \end{aligned}$$

$$83. x^5 \cdot \frac{1}{x^2} = x^{5-2} = x^3$$

$$84. \frac{x^4 y^5}{xy^3} = x^{4-1} y^{5-3} = x^3 y^2$$

$$85. -5^{-2} y^0 = \frac{1}{-5^2} = -\frac{1}{25}$$

$$86. (4x^{-3})^4 \cdot \left(\frac{x^6}{2}\right)^2 = \frac{4^4}{(x^3)^4} \cdot \frac{x^{12}}{2^2} = \frac{256}{x^{12}} \cdot \frac{x^{12}}{4} = 64$$

$$87. \frac{3x^5 y^8}{6xy^{-3}} = \frac{1}{2} x^{5-1} y^{8+3} = \frac{1}{2} x^4 y^{11}$$

$$88. \frac{6x^4 y^2}{30x^2 y^{-1}} = \frac{1}{5} x^{4-2} y^{2+1} = \frac{1}{5} x^2 y^3$$

### 6.3 Quiz 1 (p. 344)

$$1. 7^0 \cdot 5^{-3} = \frac{1}{5^3} = \frac{1}{125} \quad 2. \left(\frac{4}{9}\right)^{-2} = \frac{9^2}{4^2} = \frac{81}{16}$$

$$3. \left(\frac{5}{3^2}\right)^2 = \frac{25}{9^2} = \frac{25}{81}$$

$$4. 3^2 \cdot (3^2 \cdot 2^4)^{-1} = 3^2 \cdot (3^{-2} \cdot 2^{-4}) = \frac{1}{2^4} = \frac{1}{16}$$

$$5. (8^2 \cdot 8^{-3})^2 \cdot 8^2 = (8^{-1})^2 \cdot 8^2 = \frac{8^2}{8^2} = 1$$

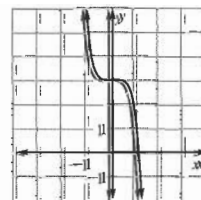
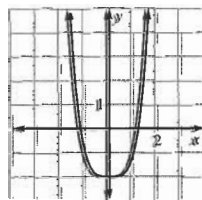
$$\begin{aligned}
 6. \frac{(2^5 \cdot 3^2)^{-1}}{2^{-2} \cdot 3^2} &= \frac{2^{-5} \cdot 3^{-2}}{2^{-2} \cdot 3^2} = 2^{-5-(-2)} = 3^{-2-2} \\
 &= 2^{-3} \cdot 3^{-4} = \frac{1}{2^3 \cdot 3^4} = \frac{1}{648}
 \end{aligned}$$

$$7. (-5)^{-2} y^0 = \frac{1}{25} \quad 8. (3x^3 y^6)^{-2} = \frac{1}{(3x^3 y^6)^2} = \frac{1}{9x^6 y^{12}}$$

$$9. x^3 y^{-5} (x^2 y)^2 = x^{3+4} y^{-5+2} = \frac{x^7}{y^3} \quad 10. (x^2 y^{-3})(xy^2) = \frac{x^3}{y}$$

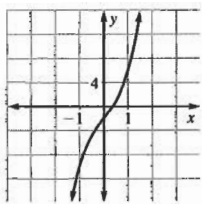
$$11. \left(\frac{2x}{y^2}\right)^{-3} = \left(\frac{y^2}{2x}\right)^3 = \frac{y^6}{8x^3} \quad 12. \frac{x^6 y^{-2}}{x^{-1} y^5} = \frac{x^7}{y^7}$$

$$13. f(x) = x^4 - 2 \quad 14. f(x) = -2x^5 + 3$$

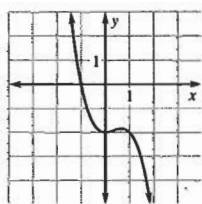


## Chapter 6 continued

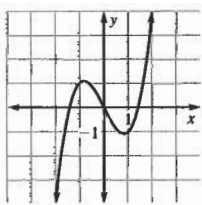
15.  $f(x) = 3x^3 + 5x - 2$



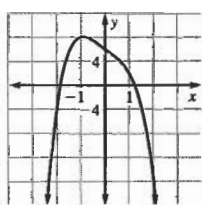
16.  $f(x) = -x^3 + x^2 - 2$



17.  $f(x) = x^3 - 2x$



18.  $f(x) = -x^4 - 3x + 6$



19.  $7x^3 + 3x^2 + 7x - 3$

20.  $3x^2 + 3x - 11$

21.  $2x^2 + 18x - 2$

22.  $3x^2 + 4x - 1 + x^3 - 2x - 5 = x^3 + 3x^2 + 2x - 6$

23.  $x(4x^2 - x - 1) + 5(4x^2 - x - 1)$   
 $= 4x^3 - x^2 - x + 20x^2 - 5x - 5$   
 $= 4x^3 + 19x^2 - 6x - 5$

24.  $(x^2 - x - 6)(2x + 5)$   
 $= 2x^3 - 2x^2 - 12x + 5x^2 - 5x - 30$   
 $= 2x^3 + 3x^2 - 17x - 30$

25.  $(x - 6)(x - 6)(x - 6)$   
 $= (x^2 - 12x + 36)(x - 6)$   
 $= x^3 - 12x^2 + 36x - 6x^2 + 72x - 216$   
 $= x^3 - 18x^2 + 108x - 216$

26.  $(2x^2 + 3)(2x^2 + 3) = 4x^4 + 6x^2 + 6x^2 + 9$   
 $= 4x^4 + 12x^2 + 9$

27.  $\frac{4.95 \times 10^8 \text{ mi}}{2.5 \times 10^4 \text{ mi/hr}} = 1.98 \times 10^4 \text{ hours}$   
 $\frac{1.98 \times 10^4 \text{ hr}}{2.4 \times 10^1 \text{ hr/day}} = .825 \times 10^3 \text{ day} = 825 \text{ days}$

### Lesson 6.4

#### Activity (p. 345)

1. *Sample answer:* The cube  $a$  is missing a small part. The part is the cube  $b$ . But the total volume can be broken into three parts. By adding the three parts, we get the same volume as we would have if we had taken the total volume of the cube  $a$  and subtracted the cube  $b$ .

2. Solid I =  $(a)(a)(a - b)$   
 Solid II =  $(b)(b)(a - b)$   
 Solid III =  $(a)(b)(a - b)$

3.  $a^3 - b^3 = [a \cdot a \cdot (a - b)] + [b \cdot b \cdot (a - b)]$   
 $+ (a \cdot b \cdot a - b)$   
 $= (a - b)(a^2 + ab + b^2)$

#### 6.4 Guided Practice (p. 348)

1. *Sample answer:*  $9x^3 - 1$
2. a. grouping    b. difference of cubes  
 c. factoring polynomial
3. You can't divide by  $2x^2$ , which contains a variable.  $x$  is also a solution.
4. a.  $(x^3 + 1) = (x + 1)(x^2 - x + 1)$   
 b. *Sample answer:* The graph of  $y = x^2 - x + 1$  does not intersect the  $x$ -axis, so  $x^2 - x + 1$  is not factorable.
5.  $x^6 + 125 = (x^2)^3 + (5)^3 = (x^2 + 5)(x^4 - 5x^2 + 25)$
6.  $4x^3 + 16x^2 + x + 4 = 4x^2(x + 4) + (x + 4)$   
 $= (x + 4)(4x^2 + 1)$
7.  $x^4 - 1 = (x^2)^2 - (1^2)^2$   
 $= (x^2 - 1)(x^2 + 1)$   
 $= (x + 1)(x - 1)(x^2 + 1)$
8.  $2x^3 - 3x^2 - 10x + 15 = x^2(2x - 3) + 5(-2x + 3)$   
 $= x^2(2x - 3) - 5(2x - 3)$   
 $= (2x - 3)(x^2 - 5)$
9.  $5x^3 - 320 = 5(x^3 - 64) = 5(x - 4)(x^2 + 4x + 16)$
10.  $x^4 + 7x^2 + 10 = (x^2 + 5)(x^2 + 2)$
11.  $x^3 - 27 = 0$   
 $x^3 = 27$   
 $x = 3$
12.  $3x^3 + 7x^2 - 12x - 28 = 0$   
 $x^2(3x + 7) - 4(3x + 7) = 0$   
 $(3x + 7)(x^2 - 4) = 0$   
 $(3x + 7)(x + 2)(x - 2) = 0$   
 $x = -\frac{7}{3}$  or  $x = \pm 2$
13.  $x^3 + 2x^2 - 9x - 18 = 0$   
 $x^2(x + 2) - 9(x + 2) = 0$   
 $(x^2 - 9)(x + 2) = 0$   
 $(x - 3)(x + 3)(x + 2) = 0$   
 $x = \pm 3$  or  $x = -2$

## Chapter 6 continued

14.  $54x^3 = -2$

$$x^3 = -\frac{1}{27}$$

$$x = -\frac{1}{3}$$

15.  $(3x^2 - 2)^2 = 0$

$$3x^2 = 2$$

$$x^2 = \frac{2}{3}$$

$$x = \pm \frac{\sqrt{6}}{3}$$

16.  $16x^8 - 81 = 0$

$$(4x^4)^2 - (9)^2 = 0$$

$$(4x^4 - 9)(4x^4 + 9) = 0$$

$$(2x^2 - 3)(2x^2 + 3)(4x^4 + 9) = 0$$

$$x = \pm \frac{\sqrt{6}}{2}$$

17.  $R = t^3 - 8t^2 + t + 82$

$$90 = t^3 - 8t^2 + t + 82$$

$$t^3 - 8t^2 + t - 8 = 0$$

$$t^2(t - 8) + (t - 8) = 0$$

$$t = 8$$

The year was 1998.

### 6.4 Practice and Application (pp. 348–350)

18.  $14x^2 + 8x + 72 = 2(7x^2 + 4x + 36)$

19.  $3x^4 - 12x^3 = 3x^3(x - 4)$

20.  $7x + 28x^2 - 35x^3 = 7x(1 + 4x - 7x^2)$

21.  $24x^4 - 6x = 6x(4x^3 - 1)$

22.  $39x^5 + 13x^3 - 78x^2 = 13x^2(3x^3 + x - 6)$

23.  $145x^9 - 17 = 1(145x^9 - 17)$

24.  $6x^6 - 3x^4 - 9x^2 = 3x^2(2x^4 - x^2 - 3)$

25.  $72x^9 + 15x^6 + 9x^3 = 3x^3(24x^6 + 5x^3 + 3)$

26.  $6x^4 - 18x^3 + 15x^2 = 3x^2(2x^2 - 6x + 5)$

27.  $3x^2 + 11x + 6 = (3x + 2)(x + 3)$  C

28.  $x^3 - 4x^2 + 4x - 16 = (x^2 + 4)(x - 4)$  D

29.  $125x^3 - 216 = (5x)^3 - (6)^3 = (5x - 6)(25x^2 + 30x + 36)$

F

30.  $2x^7 - 32x^3 = 2x^3(x^4 - 16) = 2x^3(x + 2)(x - 2)(x^2 + 4)$

A

31.  $2x^5 + 4x^4 - 4x^3 - 8x^2 = 2x^2(x^3 + 2x^2 - 2x - 4)$   
 $= 2x^2(x^2 - 2)(x + 2)$

E

32.  $2x^3 - 32x = 2x(x^2 - 16) = 2x(x + 4)(x - 4)$

B

33.  $x^3 - 8 = (x - 2)(x^2 + 2x + 4)$

34.  $x^3 + 64 = (x + 4)(x^2 - 4x + 16)$

35.  $216x^3 + 1 = (6x + 1)(36x^2 - 6x + 1)$

36.  $125x^3 - 8 = (5x - 2)(25x^2 + 10x + 4)$

37.  $1000x^3 + 27 = (10x + 3)(100x^2 - 30x + 9)$

38.  $27x^3 + 216 = 27(x + 2)(x^2 - 2x + 4)$

39.  $32x^3 - 4 = 4(8x^3 - 1) = 4(2x - 1)(4x^2 + 2x + 1)$

40.  $2x^3 + 54 = 2(x^3 + 27) = 2(x + 3)(x^2 - 3x + 9)$

41.  $x^3 + x^2 + x + 1 = x^2(x + 1) + (x + 1)$   
 $= (x + 1)(x^2 + 1)$

42.  $10x^3 + 20x^2 + x + 2 = 10x^2(x + 2) + (x + 2)$   
 $= (x + 2)(10x^2 + 1)$

43.  $x^3 + 3x^2 + 10x + 30 = x^2(x + 3) + 10(x + 3)$   
 $= (x + 3)(x^2 + 10)$

44.  $x^3 - 2x^2 + 4x - 8 = x^2(x - 2) + 4(x - 2)$   
 $= (x - 2)(x^2 + 4)$

45.  $2x^3 - 5x^2 + 18x - 45 = x^2(2x - 5) + 9(2x - 5)$   
 $= (2x - 5)(x^2 + 9)$

46.  $-2x^3 - 4x^2 - 3x - 6 = -2x^2(x + 2) - 3(x + 2)$   
 $= (x + 2)(-2x^2 - 3)$

47.  $3x^3 - 6x^2 + x - 2 = 3x^2(x - 2) + (x - 2)$   
 $= (x - 2)(3x^2 + 1)$

48.  $2x^3 - x^2 + 2x - 1 = x^2(2x - 1) + (2x - 1)$   
 $= (2x - 1)(x^2 + 1)$

49.  $3x^3 - 2x^2 - 9x + 6 = x^2(3x - 2) - 3(3x - 2)$   
 $= (3x - 2)(x^2 - 3)$

50.  $16x^4 - 1 = (4x^2 - 1)(4x^2 + 1) = (2x - 1)(2x + 1)(4x^2 + 1)$

51.  $x^4 + 3x^2 + 2 = (x^2 + 1)(x^2 + 2)$

52.  $x^4 - 81 = (x^2 - 9)(x^2 + 9) = (x - 3)(x + 3)(x^2 + 9)$

53.  $81x^4 - 256 = (9x^2 - 16)(9x^2 + 16)$   
 $= (3x - 4)(3x + 4)(9x^2 + 16)$

54.  $4x^4 - 5x^2 - 9 = (4x^2 - 9)(x^2 + 1)$   
 $= (2x - 3)(2x + 3)(x^2 + 1)$

55.  $x^4 + 10x^2 + 16 = (x^2 + 2)(x^2 + 8)$

56.  $81 - 16x^4 = (9 - 4x^2)(9 + 4x^2)$   
 $= (3 - 2x)(3 + 2x)(9 + 4x^2)$

57.  $32x^6 - 2x^2 = 2x^2(16x^4 - 1)$   
 $= 2x^2(4x^2 + 1)(4x^2 - 1)$   
 $= 2x^2(4x^2 + 1)(2x - 1)(2x + 1)$

58.  $6x^5 - 51x^3 - 27x = 3x(2x^4 - 17x^2 - 9)$   
 $= 3x(2x^2 + 1)(2x^2 - 9)$   
 $= 3x(2x^2 + 1)(x + 3)(x - 3)$

## Chapter 6 continued

$$59. 18x^3 - 2x^2 + 27x - 3 = 2x^2(9x - 1) + 3(9x - 1) \\ = (9x - 1)(2x^2 + 3)$$

$$60. 6x^3 + 21x^2 + 15x = 3x(2x^3 + 7x + 5) \\ = 3x(2x + 5)(x + 1)$$

$$61. 4x^4 + 39x^2 - 10 = (4x^2 - 1)(x^2 + 10) \\ = (2x + 1)(2x - 1)(x^2 + 10)$$

$$62. 8x^3 - 12x^2 - 2x + 3 = 4x^2(2x - 3) - (2x - 3) \\ = (2x - 3)(4x^2 - 1) \\ = (2x - 3)(2x - 1)(2x + 1)$$

$$63. 8x^3 - 64 = (2x - 4)(4x^2 + 8x + 16) \\ = 8(x - 2)(x^2 + 2x + 4)$$

$$64. 3x^4 - 300x^2 = 3x^2(x^2 - 100) = 3x^2(x + 10)(x - 10)$$

$$65. 3x^4 - 24x = 3x(x^3 - 8) = 3x(x - 2)(x^2 + 2x + 4)$$

$$66. 5x^4 + 31x^2 + 6 = (5x^2 + 1)(x^2 + 6)$$

$$67. 3x^4 + 9x^3 + x^2 + 3x = 3x^3(x + 3) + x(x + 3) \\ = x(x + 3)(3x^2 + 1)$$

$$68. x^3 - 3x^2 = 0 \quad 69. 2x^3 - 6x^2 = 0 \\ x^2(x - 3) = 0 \quad 2x^2(x - 3) = 0 \\ 0, 3 \quad 0, 3$$

$$70. 3x^4 + 15x^2 - 72 = 0 \quad 71. x^3 + 27 = 0 \\ (3x^2 - 9)(x^2 + 8) = 0 \quad x^3 = -27 \\ x = \pm\sqrt{3} \quad x = -3$$

$$72. x^3 + 2x^2 - x - 2 = 0 \\ x^2(x + 2) - 1(x + 2) = 0 \\ (x + 2)(x^2 - 1) = 0 \\ (x + 2)(x + 1)(x - 1) = 0 \\ -2, -1, 1$$

$$73. x^4 + 7x^3 - 8x - 56 = 0 \quad 74. 2x^4 - 26x^2 + 72 = 0 \\ x^3(x + 7) - 8(x + 7) = 0 \quad (2x^2 - 8)(x^2 - 9) = 0 \\ (x + 7)(x^3 - 8) = 0 \quad 2(x^2 - 4)(x^2 - 9) = 0 \\ -7, 2 \quad \pm 2, \pm 3$$

$$75. 3x^7 - 243x^3 = 0 \quad 76. x^3 + 3x^2 - 2x - 6 = 0 \\ 3x^3(x^4 - 81) = 0 \quad x^2(x + 3) - 2(x + 3) = 0 \\ 3x^3(x^2 - 9)(x^2 + 9) = 0 \quad (x + 3)(x^2 - 2) = 0 \\ 0, \pm 3 \quad -3, \pm\sqrt{2}$$

$$77. 8x^3 - 1 = 0 \quad 78. x^3 + 8x^2 + 16x = 0 \\ x^3 = \frac{1}{8} \quad x(x^2 + 8x + 16) = 0 \\ x = \frac{1}{2} \quad x(x + 4)^2 = 0 \\ 0, -4$$

$$79. x^3 - 5x^2 + 5x - 25 = 0 \\ x^2(x - 5) + 5(x - 5) = 0 \\ (x - 5)(x^2 + 5) = 0$$

$$80. 3x^4 + 3x^3 - 6x^2 - 6x = 0 \\ 3x^3(x + 1) - 6x(x + 1) = 0 \\ 3x(x^2 - 2)(x + 1) = 0 \\ 0, -1, \pm\sqrt{2}$$

$$81. x^4 + x^3 - x - 1 = 0 \quad 82. 4x^4 + 20x^2 = -25 \\ x^3(x + 1) - (x + 1) = 0 \quad \text{none; left side will} \\ (x + 1)(x^3 - 1) = 0 \quad \text{be a positive number} \\ -1, 1$$

$$83. -2x^6 = 16 \quad 84. 3x^7 - 81x^4 = 0 \\ x^6 = -8 \quad 3x^4(x^3 - 27) = 0 \\ \text{none; left side is always} \quad 0, 3 \\ \text{positive}$$

$$85. 2x^5 - 12x^3 + 16x = 0 \\ 2x(x^4 - 6x^2 + 8) = 0 \\ 2x(x^2 - 4)(x^2 - 2) = 0 \\ 0, \pm 2, \pm\sqrt{2}$$

86. Sample answer should include:

- For two terms, finding a common factor and using sum/difference of cubes.
- For 3 terms, look for a quadratic pattern.
- For 4 or more terms, grouping and looking for a common factor.

$$87. 30 = x(x - 2)(x + 5) \\ 30 = x(x^2 + 3x - 10) \\ 0 = x^3 + 3x^2 - 10x - 30 \\ 0 = x^2(x + 3) - 10(x + 3) \\ 0 = (x + 3)(x^2 - 10) \\ x = \sqrt{10} \approx 3.16$$

$$3.16 \text{ in.} \times 1.16 \text{ in.} \times 8.16 \text{ in.}$$

$$88. 72 = x(x - 1)(x + 9) \\ 72 = x^3 + 8x^2 - 9x \\ 0 = x^3 + 8x^2 - 9x - 72 \\ 0 = x^2(x + 8) - 9(x + 8) \\ 0 = (x + 8)(x^2 - 9) \\ 0 = (x + 8)(x - 3)(x + 3) \\ x = 3$$

$$\text{width: 2 ft length: 3 ft height: 12 ft}$$

$$89. 4 = x(6x - 2)(3x - 2) \\ 4 = 18x^3 - 18x^2 + 4x \\ 0 = 18x^2(x - 1) + 4(x - 1) \\ 0 = (18x^2 + 4)(x - 1) \\ x = 1 \\ 6 \text{ ft} \times 3 \text{ ft} \times 1 \text{ ft}$$

## Chapter 6 continued

90.  $25 = x(5x - 10)(2x - 1)$   
 $25 = x(10x^2 - 25x + 10)$   
 $25 = 10x^3 - 25x^2 + 10x$   
 $0 = 5x^2(2x - 5) + 5(2x - 5)$   
 $0 = (2x - 5)(5x^2 + 5)$   
 $x = 2\frac{1}{2}$

$2\frac{1}{2} \text{ ft} \times 2\frac{1}{2} \text{ ft} \times 4 \text{ ft}$

91.  $250 = \frac{1}{3}(x - 5)^2 3x$   
 $250 = x(x^2 - 10x + 25)$   
 $0 = x^3 - 10x^2 + 25x - 250$   
 $0 = x^2(x - 10) + 25(x - 10)$   
 $0 = (x - 10)(x^2 + 25)$   
 $x = 10$

$5 \text{ ft} \times 5 \text{ ft} \times 30 \text{ ft}$

92.  $250 = (x - 5)^2 x$   
 $250 = (x^2 - 10x + 25)x$   
 $250 = x^3 - 10x^2 + 25x$   
 $x^3 - 10x^2 + 25x - 250 = 0$   
 $x^2(x - 10) + 25(x - 10) = 0$   
 $(x^2 + 25)(x - 10) = 0$   
 $x = 10$

5 in. by 5 in. by 10 in.

93.  $(3x - 4)(9x^2 + 12x + 16)$     94.  $x^3 - 8$   
 $27x^2 - 64$      $(x - 2)(x^2 + 2x + 4)$   
 C    D

95.  $x^5 = 81x$   
 $x(x^4 - 81) = 0$   
 $x(x^2 - 9)(x^2 + 9) = 0$   
 $x(x - 3)(x + 3)(x^2 + 9) = 0$   
 $0, \pm 3$   
 D

96. *Sample answer:* If we think of the total volume equal to the 3 prisms:  $a^2(a - b)$ ,  $ab(a - b)$ , and  $b^2(a + b)$  Then  $a(a - b)(a + b) + b^2(a + b)(a + b)(a^2 - ab + b^2) = a^3 + b^3$

97.  $30x^2y + 36x^2 - 20xy - 24x$   
 $= 2x(15xy + 18x - 10y - 12)$   
 $= 2x(3x - 2)(5y + 6)$

98.  $2x^7 - 127x = x(2x^6 - 127)$

### 6.4 Mixed Review (p. 351)

99.  $\frac{6x^3y^9}{36x^3y^{-2}} = \frac{1}{6}y^{11}$     100.  $\frac{5^{-2}x^2y^{-1}}{5^2xy^3} = \frac{x}{625y^4}$

101.  $\frac{7^2x^{-3}y^2}{49x^{-3}y^{-2}} = y^4$

102.  $f(3) = 3(3)^4 + 2(3)^3 - (3)^2 - 12(3) + 1$   
 $= 243 + 54 - 9 - 36 + 1$   
 $= 253$

103.  $f(3) = 2(3)^5 - (3)^3 + 7(3) + 1$   
 $= 486 - 27 + 21 + 1$   
 $= 481$

104.  $T = 4s + 6p + 8$

### Math and History (p. 351)

1.

y	1	2	3	4	5
f(y)	2	12	36	80	150

y	6	7	8	9	10
f(y)	252	392	576	810	1100

2.  $x^3 + x^2 = 252$   
 $x = 6$

3.  $x^3 + 2x^2 = 288$   
 $\left(\frac{x}{2}\right)^3 + \left(\frac{x}{2}\right)^2 = 36$

$y = 3$   
 $x = \frac{(2)(3)}{1} = 6$

4.  $3x^3 + x^2 = 90$   
 $27x^3 + x^2 = 810$   
 $(3x)^3 + (x)^2 = 810$   
 $y = 9$   
 $x = \frac{(1)(9)}{3} = 3$

5.  $2x^3 + 5x^2 = 2500$   
 $\left(\frac{2x}{5}\right)^3 + \left(\frac{2x}{5}\right)^2 = 80$   
 $y = 4$   
 $x = \frac{(5)(4)}{2} = 10$

6.  $7x^3 + 6x^2 = 1728$   
 $\left(\frac{7x}{6}\right)^3 + \left(\frac{7x}{6}\right)^2 = 392$   
 $y = 7$   
 $x = \frac{(6)(7)}{(7)} = 6$

7.  $10x^3 + 3x^2 = 297$   
 $\left(\frac{10x}{3}\right)^3 + \left(\frac{10x}{3}\right)^2 = 1100$   
 $y = 10$   
 $x = \frac{(3)(10)}{10} = 3$

### Lesson 6.5

#### 6.5 Activity (p. 353)

1.  $3x^2 + 4x + 10; 3x^2 + 4x + 10 + \frac{15}{x - 2};$   
 $x - 2 \sqrt{3x^3 - 2x^2 + 2x - 5}$   
 $\frac{-3x^2 + 6x^2}{4x^2 + 2x}$   
 $\frac{-4x^2 + 8x}{10x - 5}$   
 $\frac{-10x + 20}{15}$