

Chapter 7
Quadratic and other Polynomial
Functions

Answer Key

Refresh Your Skills

1a) $8x + 6$

1b) $4x^3 + 10x^2 + 1.8x + 2.5$

1c) $-3a^2 - 9a + 7$

1d) $-8x + 8$

2a) $x^2 + 6x + 9$

2b) $-4x^2 + 9x + 28$

2c) $x^2 - 16$

2d) $2x^3 + 7x^2 + 5x - 2$

3a) $x \quad 5$

x	x^2	$5x$
5	$5x$	25

3b) $x \quad 4$

2x	$2x^2$	$8x$
-3	$-3x$	-12

3c) $x \quad -6$


x	x^2	$-6x$
6	$6x$	-36

4a) $x^2 + 10x + 25$

4b) $2x^2 + 5x - 12$

4c) $x^2 - 36$

4) (c), the product is two perfect squares that are subtracted.



Section 7.1a

1a) 3 1b) 2 1c) 7 1d) 5

2a) *polynomial*; $3; \frac{5}{9}x^3 - 3.5x^2 + 4x - 3$ 3a) *no*; $\{2.2, 2.6, 1.8, -0.2, -3.4\}$

2b) *not polynomial*; neg exponent 3b) *no*; $\{0.007, 0.006, 0.008, 0.010\}$

2c) *not polynomial*; Rational exponent 3c) *no*; $\{150, 150, 150\}$

2d) *polynomial*; $2; x^2\sqrt{15} - x - 4^{-2}$ 4) 3

5a) $D_1 = \{2, 3, 4, 5, 6\}; D_2 = \{1, 1, 1, 1\}; 2nd \text{ Degree}$

5b) The polynomial is 2nd Degree, and the D_2 values are constant

5c) 4, you need at least 2 numbers for the second difference

5d) $s = 0.5n^2 + 0.5n; s = 78$

5e) The pennies can be arranged to form triangles



Section 7.1b

6a)

Layers (x)	1	2	3	4	5	6
Blocks (y)	1	5	14	30	55	91

6b) $y = \frac{1}{3}x^3 + \frac{1}{2}x^2 + \frac{1}{6}x$ 6c) 204 Blocks 6d) 12 Layers

7ai) $D_1 = \{15.1, 5.3, -4.5, -14.3, -24.1, -33.9\}$ 7bi) 2

$$D_2 = \{-9.8, -9.8, -9.8, -9.8, -9.8\}$$

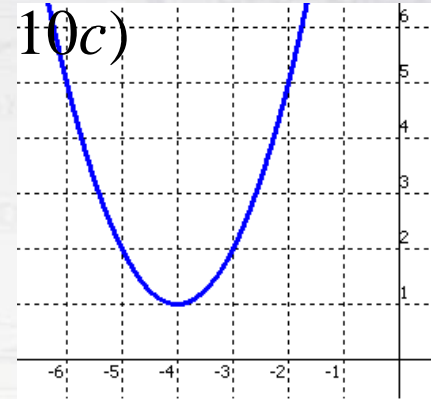
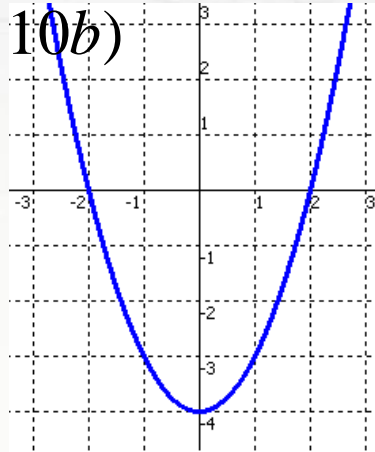
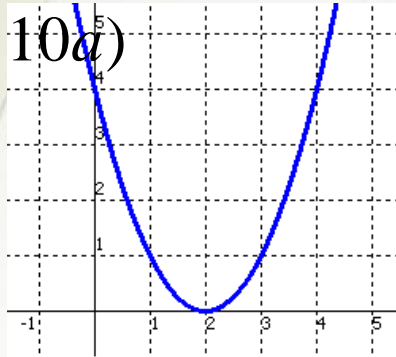
$$7ci) h = -4.9t^2 + 20t + 80$$

7aii) $D_1 = \{59.1, 49.3, 39.5, 29.7, 19.1, 10.1\}$ 7bii) 2

$$D_2 = \{-9.8, -9.8, -9.8, -9.8, -9.8\}$$

$$7cii) h = -4.9t^2 + 64t + 4$$

Section 7.1c



12a) $2x \quad 3$

$3x$	$6x^2$	$9x$
1	$2x$	3

12b) $6x^2 + 11x + 3$

12c) $x \quad 5$

x	x^2	$5x$
3	$3x$	15

12d) $(x + 3)(x + 5)$

Section 7.2

2a) (2,3)

2b) (-4,-2)

2c) (5,4)

3a) -1 and 2

3b) -3 and 2

3c) 2 and 5

4a) $y = x^2 - 4x + 7$

4b) $y = 0.5x^2 + 4x + 6$

4c) $y = -2x^2 + 20x - 46$

5a) $y = x^2 - x - 2$

5b) $y = 0.5x^2 + 0.5x - 3$

5c) $y = -2x^2 + 14x - 20$

6a) $x = 4.5$

6b) (4.5,19); maximum

6c) $y = -3(x - 4.5)^2 + 19$

9a) $y = (x + 2)(x - 1)$

9b) $y = -0.5(x + 2)(x - 3)$

9c) $y = \frac{1}{3}(x + 2)(x - 1)(x - 3)$

11a)

Width	5	10	15	20	25
Length	35	30	25	20	15
Area	175	300	375	400	475

11b) $y = x(x - 40)$

11c) $Width = 20m, Area = 400m^2$

11d) $0m$ and $40m$

13a) $12x^2 - 15x$

13b) $x^2 - 2x - 15$

13c) $x^2 - 49$

13d) $9x^2 - 6x + 1$

Section 7.3

1a) $(x-5)^2$ 1b) $\left(x+\frac{5}{2}\right)^2$ 1c) $(2x-3)^2$ or $4\left(x-\frac{3}{2}\right)^2$ 1d) $(x-y)^2$

2a) 100 2b) $\frac{49}{4}$ 2c) 16 2d) -3 3a) $y = (x+10)^2 - 6$

3b) $y = (x-3.5)^2 + 3.75$ 3c) $y = 6(x-2)^2 + 123$ 3d) $y = 5(x+0.8)^2 - 3.2$

4a) $3x^2 + 2x - 5$ 4b) $2x^2 + 14$ 4c) $4x^2 + 6x - 3$
 $a = 3, b = 2, c = -5$ $a = 2, b = 0, c = 14$ $a = 4, b = 6, c = -3$

4d) $-x^2 + 3x$ 5) $(-4, 12)$ 7a) $h = -4.9(t-1.1)(t-4.7)$
 $a = -1, b = 3, c = 0$ $or h = -4.9t^2 + 28.42t - 25.333$

7b) $28.42m / s$ 7c) $25.333m$ 9) $h = -4.9t^2 + 17.2t + 50$

13) $x = 2, x = -3, x = \frac{1}{2}$

Section 7.4a

1a) $3x^2 - 13x - 10 = 0$ 1b) $x^2 - 5x - 13 = 0$ 1c) $3x^2 + 5x + 1 = 0$
 $a = 3, b = -13, c = -10$ $a = 1, b = -5, c = -13$ $a = 3, b = 5, c = 1$

1d) $3x^2 - 3x - 2 = 0$ 1e) $x^2 - 15x + 50 = 0$
 $a = 3, b = -3, c = -2$ $a = 1, b = -15, c = 50$

2a) -0.102 2b) -5.898 2c) -0.243 2d) 8.243

3a) $x = 1$ or $x = 5$ 3b) $x = -2$ or $x = 9$ 3c) $x = -1$ or $x = -1.4$

4a) $y = (x - 1)(x - 5)$ 4b) $y = (x + 2)(x - 9)$ 4c) $y = 5(x + 1)(x + 1.4)$

5a) $x = \frac{1}{2}$ or $x = -4$ 5b) $x = 3 \pm \sqrt{6}$ 5c) $x = \pm\sqrt{3}$ 5d) *no real solutions*

6a) $x^2 + 9x + 10 = 0$ 5c) $x = \frac{-9 \pm \sqrt{41}}{2}$ 6c) $\frac{-9 + \sqrt{41}}{2}$ and $\frac{-9 - \sqrt{41}}{2}$

Section 7.4b

8) The solution includes the square root of -36 , so there are no real solutions. The graph shows no x -intercepts. Before using the quadratic formula, evaluate b^2-4ac . If $b^2-4ac < 0$ then there will be no real solutions.

$$11a) y = -4x^2 - 6.8x + 49.2 \quad 11b) 49.2L \quad 11c) 2.76 \text{ min}$$

$$13a) x^2 + 14x + 49 = (x + 7)^2$$

$$13b) x^2 - 10x + 25 = (x - 5)^2$$

$$\text{or } x + (-14x) + 49 = (x + (-7))^2$$

$$13c) x^2 + 3x + \frac{9}{4} = \left(x + \frac{3}{2}\right)^2$$

$$13d) 2x^2 + 8x + 8 = 2(x^2 + 4x + 4) = 2(x + 2)^2$$

$$\text{or } 2x^2 + (-8x) + 8 = 2(x^2 + (-4x) + 4) = 2(x + (-2))^2$$

Section 7.5

1a) $8 + 4i$

1b) 7

1c) $4 - 2i$

1d) $-2.56 - 0.61i$

2a) $20 + 22i$

2b) $-6 + 12i$

2c) $15 + 6i$

2d) $2.5413 + 21.1081i$

3a) $5 + i$

3b) $-1 - 2i$

3c) $2 - 3i$

3d) $-2.35 + 2.71i$

6) $x^2 - 4x + 5 = 0$ 7a) $-i$ 7b) 1 7c) i 7d) -1 9) $0.2 + 1.6i$

10a) ± 1 ; Complex and Real

10b) $\pm i$; Complex and Imaginary

10c) $2 \pm i\sqrt{2}$; Complex

10d) $-\frac{1}{2} \pm i\frac{\sqrt{3}}{2}$; Complex

10e) $1 \pm \frac{i\sqrt{3}}{2}$; Complex

11a) $y = x^2 - 2x - 15$

11b) $y = x^2 + 7x + 12.25$

11c) $y = x^2 + 25$

11d) $y = x^2 = 4x + 5$

13a) $x = (5 \pm \sqrt{34})$

13b) $x = 2i$ or $x = i$

13b) the coefficients of the quadratic equations are nonreal

Section 7.6a

1a) x - int : $(-1.5, 0) \& (-6, 0)$; y - int : $(0, -2.25)$

1b) x - int : $(4, 0) \& (4, 0)$; y - int : $(0, 48)$

1c) x - int : $(3, 0), (-2, 0) \& (-5, 0)$; y - int : $(0, 60)$

1d) x - int : $(-3, 0) \& (3, 0)$; y - int : $(0, -135)$

2a) $y = 2(x - 2)(x - 4)$

2b) $y = -0.25(x + 1.5)(x + 6)$

3a) $y = x^2 - 10x + 24$

3b) $y = x^2 - 6x + 9$

3c) $y = x^3 - 64x$

3d) $y = 3x^2 + 15x^2 - 12x - 60$

4a) $(7.5, 0), (-2.5, 0), (3.2, 0)$

4b) $(0, 150)$

4c) $y = 2.5x^3 - 20.5x^2 - 6.875x + 150$

4d) *check*

Section 7.6b

$$6a) 4(x-12)(x-10)$$

$$6b) 6\left(x-\frac{3}{3}\right)\left(x+\frac{1}{2}\right) \text{ or } (3x-5)(2x+1)$$

$$6c) (x+2)(x-2)(x+5)$$

$$6d) 2(x+1)(x+3)(x+4)$$

$$6e) (a+b)(a+b)$$

$$6f) (x-8)(x+8)$$

$$6g) (x+8i)(x-8i)$$

$$6h) (x+\sqrt{7})(x-\sqrt{7})$$

$$6i) x(x-3)$$

$$8) y = -0.3(x+4.5)(x+1)(x-2)$$

$$9a) y = a(x+5)(x-3)(x-6)$$

$$9b) y = 2(x+5)(x-3)(x-6)$$

$$9c) y = 2(x+5)(x-3)(x-6)+100$$

$$9d) y = 2(x+9)(x+1)(x-2)$$

$$13a) x = \pm\sqrt{50.4}$$

$$13b) x = \pm\sqrt{13}$$

$$13c) x = 2.4 \pm \sqrt{40.2}$$

$$13d) x = -4$$

Section 7.7a

1a) $x = -5, x = 3, \text{ and } x = 7$

2a) $(0, 105)$

3a) 3

1b) $x = -6, x = -3, x = 2, \text{ and } x = 6$

2b) $(0, 108)$

3b) 4

1c) $x = -5 \text{ and } x = 2$

2c) $(0, -100)$

3c) 2

1d) $x = -5, x = -3, x = 1, x = 4, \text{ and } x = 6$

2d) $(0, -90)$

3d) 5

4a) $y = (x + 5)(x - 3)(x - 7)$

4b) $y = 0.5(x + 6)(x + 3)(x - 2)(x - 6)$

4c) $y = 10(x + 5)(x - 2)$

4d) $y = 0.25(x + 5)(x + 3)(x - 1)(x - 4)(x - 6)$

7a) 4

7b) 5

7c) $y = -x(x + 5)^2(x + 1)(x - 4)$

8a) $y = (x + 4)(x - 5)(x + 2)^2$

8b) $y = -2(x + 4)(x - 5)(x + 2)^2$

8c) $y = ax \left(x - \frac{1}{3} \right) \left(x + \frac{2}{5} \right) \text{ or } y = ax(3x - 1)(5x + 2)$

8d) $y = (x + 5i)(x - 5)i(x + 1)^3(x - 4)$

Section 7.7b

$$11ai) \quad y = (x+5)^2(x+2)(x-1)$$

$$11bi) \quad y = x = -5, x = -5, x = -2, x = 1$$

$$11aii) \quad y = -(x+5)^2(x+2)(x-1)$$

$$11bii) \quad y = x = -5, x = -5, x = -2, x = 1$$

$$11aiii) \quad y = (x+5)^2(x+2)(x-1)^2$$

$$11biii) \quad y = x = -5, x = -5, x = -2, x = 1, x = 1$$

$$11aiv) \quad y = -(x+5)(x+2)^3(x-1)$$

$$11biv) \quad y = x = -5, x = -2, x = -2, x = -2, x = 1$$

14c) *a* : factors of constant: $\pm 1, \pm 2, \pm 5, \pm 10$, factors of LC $\pm 1, \pm 3$

b : factors of constant: $\pm 1, \pm 3$, factors of LC $\pm 1, \pm 2, \pm 3, \pm 6$

root is ration of costant factor to LC factor

$$15) \quad 3 - 5\sqrt{2}; 0 = a(x^2 - 6x - 41)$$

$$12a) \quad i. 4; ii. 4; iii. 5; iv. 5$$

$$12b) \quad i. 3; ii. 3; iii. 4; iv. 2$$

12b) # extreme values of
degree n is at most $n-1$

$$12d) \quad i. n; ii. n; iii. n; iv. n-1$$

$$14a) \quad x = -\frac{2}{3} \text{ or } x = 5$$

$$14b) \quad x = \frac{3}{2} \text{ or } x = \frac{1}{3}$$

Section 7.8a

1a) $3x^2 + 7x + 3$

1b) $6x^3 - 4x^2$

2a) $3x^3 + 22x^2 + 38x + 15 = (x + 5)(3x^2 + 7x + 3)$

2b) $6x^3 + 11x^2 - 19x + 6 = (3x - 2)(2x^2 + 5x - 3)$

3a) $a = 12$

3b) $b = 2$

3c) $c = 7$

3d) $a = -4$

4a) $3x^3 - 11x^2 + 7x - 44 = (x - 4)(3x^2 + x + 11)$

4b) $x^3 + 5x^2 - x - 21 = (x + 3)(x^2 + 2x - 7)$

4c) $4x^3 - 8x^2 + 7x - 6 = (x - 1.5)(4x^2 - 2x + 4)$

4d) $x^3 + 7x^2 + 11x - 4 = (x + 4)(x^2 + 3x - 1)$

5) $\pm 15, \pm 5, \pm 3, \pm 1 \pm \frac{15}{2}, \pm \frac{5}{2}, \pm \frac{3}{2}, \pm \frac{1}{2}$

7a) Show work

7b) $x = -3i$ and $x = \frac{1}{2}$

8a) 4

8b) $x = 3, x = 2, x = -5, x = -1$

8c) $y = (x + 5)(x + 1)(x - 1)(x - 2)$

9a) $y = x(x - 7)(x + 2)$

zeros: 0, 7, and -2

9b) $y = (x - 5)(x + 6)(x + 2)$

zeros: 5, -6, and -2

13a) $2x^2 \quad 4x \quad -3$

x	$2x^3$	$4x^2$	$-3x$
5	$10x^2$	$20x$	-15

13b) $(x + 5)(2x^2 + 4x - 3)$

Section 7.8b

17a) $y = x^2 - 4x - 12$; $y = (x - 6)(x + 2)$; *vertex* $(2, -16)$; *y*-int $(0, -12)$;
x-int $(6, 0)$ & $(-2, 0)$

17b) $y = 3x^2 + 6x - 24$; $y = 3(x - 2)(x + 4)$; *vertex* $(-1, -27)$; *y*-int $(0, -24)$;
x-int $(2, 0)$ & $(-4, 0)$

17c) $y = -\frac{1}{2}x^2 + 5x + 12$; $y = -\frac{1}{2}(x - 12)(x + 2)$; *vertex* $\left(5, \frac{49}{2}\right)$; *y*-int $(0, 12)$;
x-int $(12, 0)$ & $(-2, 0)$

17d) $y = 2x^2 - 12x + 21$; $y = 2\left(x - \frac{6 + i\sqrt{6}}{2}\right)\left(x - \frac{6 - i\sqrt{6}}{2}\right)$; *vertex* $(3, 3)$;
y-int 21 ; *x*-int *none*

18a) $x = -3$ or $x = 1$

18b) $x = \frac{-3 \pm \sqrt{37}}{2}$

18c) $x = 1 \pm 2i$