

Unit 5 Practice #4

Name: _____

Transformations: Describe how the parent function $y=x^2$ was transformed to create each function given.

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

2. $y = (-5x)^2$

3. $y = \frac{2}{3}x^2 + 10$

4. $y = 8x^2 - 1$

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

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

Converting between the Forms: Convert the given quadratic to listed form.

7. $y = 6(x+3)^2 - 5$; standard form

8. $y = (x-4)^2 + 8$; standard form

9. $y = -3(x-2)(x-4)$; standard form

10. $y = 2(x-5)(x+2)$; standard form

11. $y = x^2 + 4x - 21$; intercept form

12. $y = 4x^2 - 8x + 3$; intercept form

13. $y = -2x^2 - 12x + 8$; vertex form

14. $y = x^2 + 10x + 2$; vertex form

Characteristics: Identify the listed characteristics for each quadratic.

15. $y = -x^2 + 6x - 3$

Vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____
 x-intercept: _____
 zeros: _____
 ROC, $-4 \leq x \leq -1$: _____

16. $y = 3x^2 - 30x - 6$

Vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____
 x-intercept: _____
 zeros: _____
 ROC, $0 \leq x \leq 5$: _____

17. $y = (x + 5)^2 - 4$

Vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____
 x-intercept: _____
 zeros: _____
 ROC, $-3 \leq x \leq -1$: _____

18. $y = -3(x + 2)^2 + 6$

Vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____
 x-intercept: _____
 zeros: _____
 ROC, $-3 \leq x \leq 0$: _____

19. $y = (x + 5)(x + 8)$

Vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____
 x-intercept: _____
 zeros: _____
 ROC, $9 \leq x \leq 10$: _____

20. $y = -2(x - 1)(x - 7)$

Vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____
 x-intercept: _____
 zeros: _____
 ROC, $1 \leq x \leq 3$: _____

21.

x	-3	-2	-1	0	1	2	3
y	0	5	8	9	8	5	0

vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____

x-intercept: _____
 zeros: _____
 ROC, $2 \leq x \leq 3$: _____

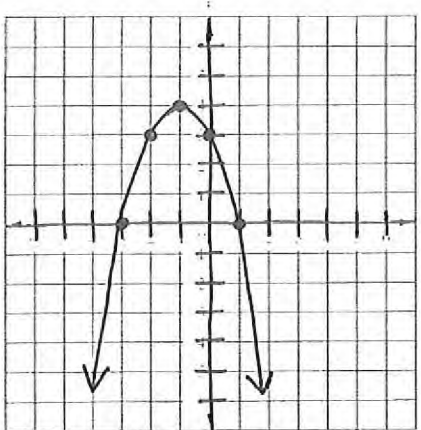
22.

x	-7	-6	-5	-4	-3	-2	-1	0
y	12	5	0	-3	-4	-3	0	5

vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____

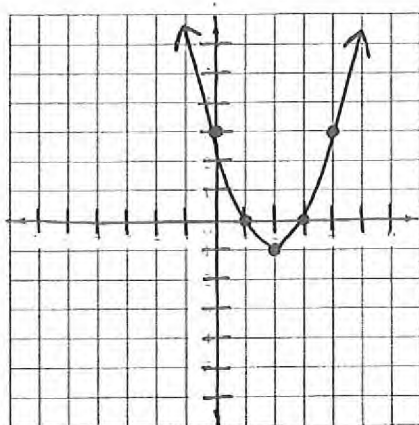
x-intercept: _____
 zeros: _____
 ROC, $-6 \leq x \leq -4$: _____

23.



Vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____
 x-intercept: _____
 zeros: _____
 Int of Inc: _____
 Int of Dec: _____
 ROC, $-2 \leq x \leq -1$: _____
 End Behavior:
 as $x \rightarrow -\infty$, $y \rightarrow$ _____
 as $x \rightarrow \infty$, $y \rightarrow$ _____

24.



Vertex: _____
 AOS: _____
 Extrema: _____
 y-intercept: _____
 x-intercept: _____
 zeros: _____
 Int of Inc: _____
 Int of Dec: _____
 ROC, $0 \leq x \leq 2$: _____
 End Behavior:
 as $x \rightarrow -\infty$, $y \rightarrow$ _____
 as $x \rightarrow \infty$, $y \rightarrow$ _____

Solving Quadratics: Solve each quadratic using the listed method. (Quadratics can also be solved by graphing...no examples of solving by graphing have been included.)

25. $0 = 4x^2 - 15x + 9$; factoring

26. $0 = x^2 + 6x + 8$; factoring

27. $0 = 4x^2 - 28x + 49$; quadratic formula

28. $y = x^2 + 4x - 21$; quadratic formula

29. $0 = -(x + 4)^2 + 1$; taking a square root

30. $2(x - 4)^2 + 3 = 9$; taking a square root

Unit 5 Practice #4

Name: key

Transformations: Describe how the parent function $y=x^2$ was transformed to create each function given.

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

reflection over x-axis
left 4

2. $y = (-5x)^2$

reflection over y-axis
horizontal shrink by $\frac{1}{5}$

3. $y = \frac{2}{3}x^2 + 10$

vertical shrink by $\frac{2}{3}$
up 10

4. $y = 8x^2 - 1$

vertical stretch by 8
down 1

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

horizontal stretch by 7
right 6

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

horizontal shrink by $\frac{1}{4}$
left 2
down 3

Converting between the Forms: Convert the given quadratic to listed form.

7. $y = 6(x+3)^2 - 5$; standard form

$$\begin{aligned} &= 6(x+3)(x+3) - 5 \\ &= 6(x^2 + 3x + 3x + 9) - 5 \\ &= 6(x^2 + 6x + 9) - 5 \\ &= 6x^2 + 36x + 54 - 5 \end{aligned}$$

$$y = 6x^2 + 36x + 49$$

9. $y = -3(x-2)(x-4)$; standard form

$$\begin{aligned} &= -3(x^2 - 4x - 2x + 8) \\ &= -3(x^2 - 6x + 8) \end{aligned}$$

$$y = -3x^2 + 18x - 24$$

8. $y = (x-4)^2 + 8$; standard form

$$\begin{aligned} &= (x-4)(x-4) + 8 \\ &= x^2 - 4x - 4x + 16 + 8 \end{aligned}$$

$$y = x^2 - 8x + 24$$

10. $y = 2(x-5)(x+2)$; standard form

$$\begin{aligned} &= 2(x^2 + 2x - 5x - 10) \\ &= 2(x^2 - 3x - 10) \end{aligned}$$

$$y = 2x^2 - 6x - 20$$

11. $y = x^2 + 4x - 21$; intercept form

$$\underline{1} \cdot \underline{-3} = -21 \quad y = x^2 + 7x - 3x - 21$$

$$\underline{1} + \underline{-3} = -4$$

	x	7
x	x^2	$7x$
-3	$-3x$	-21

$$y = (x+7)(x-3)$$

12. $y = 4x^2 - 8x + 3$; intercept form

$$\begin{aligned} \underline{-6} \cdot \underline{-2} &= +12 & y &= 4x^2 - 6x - 2x + 3 \\ \underline{-6} + \underline{-2} &= -8 & & \end{aligned}$$

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

$$y = (2x-3)(2x-1)$$

13. $y = -2x^2 - 12x + 8$; vertex form

$$x = \frac{-(-12)}{2(-2)} = \frac{12}{-4} = -3$$

$$\begin{aligned} y &= -2(-3)^2 - 12(-3) + 8 \\ &= -18 + 36 + 8 = 18 + 8 = 26 \end{aligned}$$

$$a = -2, h = -3, k = 26$$

$$y = -2(x+3)^2 + 26$$

14. $y = x^2 + 10x + 2$; vertex form

$$x = \frac{-10}{2(1)} = \frac{-10}{2} = -5$$

$$\begin{aligned} y &= (-5)^2 + 10(-5) + 2 \\ &= 25 - 50 + 2 = -25 + 2 = -23 \end{aligned}$$

$$a = 1, h = -5, k = -23$$

$$y = (x+5)^2 - 23$$

Characteristics: Identify the listed characteristics for each quadratic.

15. $y = -x^2 + 6x - 3$

Vertex: $(3, 6)$

AOS: $x = 3$

Extrema: max at 6

y-intercept: $(0, -3)$

x-intercept: $(3+\sqrt{6}, 0), (3-\sqrt{6}, 0)$

zeros: $3 \pm \sqrt{6}$

ROC, $-4 \leq x \leq -1$: 11

$\frac{-10 - (-43)}{-1 - (-4)} = \frac{33}{3} = 11$

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

$-(-3)^2 + 6(3) - 3$

$-9 + 18 - 3$

$9 - 3 = 6$

$f(a) = -(-1)^2 + 6(-1) - 3$

$= -1 - 6 - 3$

$= -10$

$f(b) = -(-1)^2 + 6(-1) - 3$

$= -1 - 6 - 3$

$= -10$

16. $y = 3x^2 - 30x - 6$

Vertex: $(5, -81)$

AOS: $x = 5$

Extrema: min at -81

y-intercept: $(0, -6)$

x-intercept: $(5+3\sqrt{3}, 0), (5-3\sqrt{3}, 0)$

zeros: $5 \pm 3\sqrt{3}$

ROC, $0 \leq x \leq 5$: -15

$\frac{-81 - (-6)}{5 - 0} = \frac{-75}{5} = -15$

$\frac{-(-30)}{2(3)} = \frac{30}{6} = 5$

$3(5)^2 - 30(5) - 6 = 75 - 150 - 6 = -81$

$x = \frac{-(-30) \pm \sqrt{(-30)^2 - 4(3)(-6)}}{2(3)}$

$= \frac{30 \pm \sqrt{900 + 72}}{6}$

$= \frac{30 \pm \sqrt{972}}{6}$

$= \frac{30 \pm \sqrt{3 \cdot 324}}{6} = \frac{30 \pm 18\sqrt{3}}{6}$

$= 5 \pm 3\sqrt{3}$

17. $y = (x+5)^2 - 4$

Vertex: $(-5, -4)$

AOS: $x = -5$

Extrema: min at -4

y-intercept: $(0, 21)$

x-intercept: $(-7, 0), (-3, 0)$

zeros: $-7, -3$

ROC, $-3 \leq x \leq -1$: 6

$\frac{12 - 0}{-1 - (-3)} = \frac{12}{2} = 6$

$= (0+5)^2 - 4$

$= 5^2 - 4 = 25 - 4 = 21$

$0 = (x+5)^2 - 4$

$4 = (x+5)^2$

$\pm 2 = x+5$

$-5 \pm 2 = x$

$-7, -3 = x$

18. $y = -3(x+2)^2 + 6$

Vertex: $(-2, 6)$

AOS: $x = -2$

Extrema: max at 6

y-intercept: $(0, -6)$

x-intercept: $(-2+\sqrt{2}, 0), (-2-\sqrt{2}, 0)$

zeros: $-2 \pm \sqrt{2}$

ROC, $-3 \leq x \leq 0$: -3

$\frac{-6 - 3}{0 - (-3)} = \frac{-9}{3} = -3$

$0 = -3(x+2)^2 + 6$

$-6 = -3(x+2)^2$

$2 = (x+2)^2$

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

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

$= -3(0+2)^2 + 6$

$= -3(4) + 6 = -12 + 6$

$= -6$

19. $y = (x+5)(x+8)$

Vertex: $(-6.5, -2.25)$

AOS: $x = -6.5$

Extrema: min at -2.25

y-intercept: $(0, 40)$

x-intercept: $(-5, 0), (-8, 0)$

zeros: $-5, -8$

ROC, $9 \leq x \leq 10$: 32

$\frac{270 - 238}{10 - 9} = \frac{32}{1} = 32$

$= (-6.5+5)(-6.5+8)$

$= (-1.5)(1.5)$

$= -2.25$

$= (0+5)(0+8)$

$= (5)(8)$

$= 40$

20. $y = -2(x-1)(x-7)$

Vertex: $(4, 18)$

AOS: $x = 4$

Extrema: max at 18

y-intercept: $(0, -14)$

x-intercept: $(1, 0), (7, 0)$

zeros: $1, 7$

ROC, $1 \leq x \leq 3$: 8

$\frac{16 - 0}{3 - 1} = \frac{16}{2} = 8$

$= -2(4-1)(4-7)$

$= -2(3)(-3)$

$= 18$

$= -2(0-1)(0-7)$

$= -2(-1)(-7) = -14$

21.

x	-3	-2	-1	0	1	2	3
y	0	5	8	9	8	5	0

vertex: $(0, 9)$

AOS: $x = 0$

Extrema: max at 9

y-intercept: $(0, 9)$

x-intercept: $(-3, 0), (3, 0)$

zeros: $-3, 3$

ROC, $2 \leq x \leq 3$: -5

$\frac{0 - 5}{3 - 2} = \frac{-5}{1} = -5$

22.

x	-7	-6	-5	-4	-3	-2	-1	0
y	12	5	0	-3	-4	-3	0	5

vertex: $(-3, -4)$

AOS: $x = -3$

Extrema: min at -4

y-intercept: $(0, 5)$

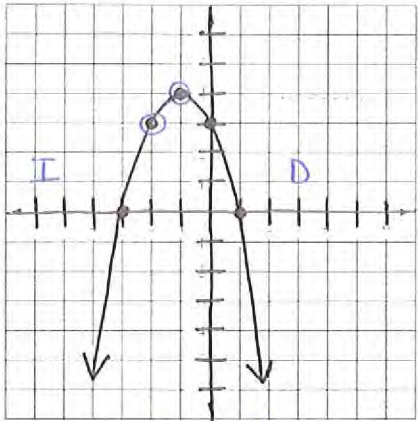
x-intercept: $(-5, 0), (-1, 0)$

zeros: $-5, -1$

ROC, $-6 \leq x \leq -4$: -4

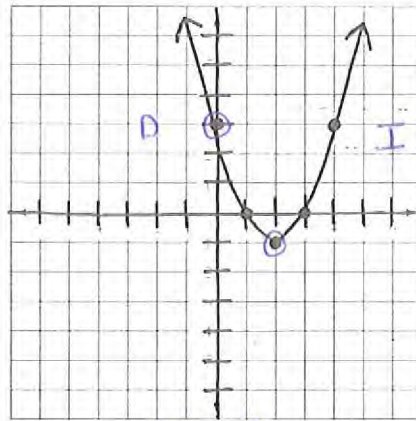
$\frac{-3 - 5}{-4 - (-6)} = \frac{-8}{2} = -4$

23.



Vertex: $(-1, 4)$
 AOS: $x = -1$
 Extrema: max at 4
 y-intercept: $(0, 3)$
 x-intercept: $(-3, 0), (1, 0)$
 zeros: $-3, 1$
 Int of Inc: $x < -1$
 Int of Dec: $x > -1$
 ROC, $-2 \leq x \leq -1$: 1 $\frac{1}{2}$
 End Behavior:
 as $x \rightarrow -\infty$, $y \rightarrow -\infty$
 as $x \rightarrow \infty$, $y \rightarrow -\infty$

24.



Vertex: $(2, -1)$
 AOS: $x = 2$
 Extrema: min at -1
 y-intercept: $(0, 3)$
 x-intercept: $(1, 0), (3, 0)$
 zeros: $1, 3$
 Int of Inc: $x \geq 2$
 Int of Dec: $x < 2$
 ROC, $0 \leq x \leq 2$: -2 $\frac{4}{2}$
 End Behavior:
 as $x \rightarrow -\infty$, $y \rightarrow \infty$
 as $x \rightarrow \infty$, $y \rightarrow \infty$

Solving Quadratics: Solve each quadratic using the listed method. (Quadratics can also be solved by graphing...no examples of solving by graphing have been included.)

25. $0 = 4x^2 - 15x + 9$; factoring

$$\begin{array}{l} -12 \cdot -3 = 36 \\ -12 + -3 = -15 \end{array} \quad \begin{array}{l} 0 = 4x^2 - 12x - 3x + 9 \\ 0 = (x-3)(4x-3) \end{array}$$

$$\begin{array}{l} x \quad -3 \\ 4x \quad \boxed{4x^2 - 12x} \\ -3 \quad \boxed{-3x \quad 9} \end{array} \quad \begin{array}{l} x-3=0 \quad 4x-3=0 \\ \boxed{x=3} \quad \boxed{x=3/4} \end{array}$$

27. $0 = 4x^2 - 28x + 49$; quadratic formula

$$x = \frac{-(-28) \pm \sqrt{(-28)^2 - 4(4)(49)}}{2(4)}$$

$$= \frac{28 \pm \sqrt{784 - 784}}{8} = \frac{28 \pm \sqrt{0}}{8} = \frac{28}{8} = \left(\frac{7}{2}\right)$$

29. $0 = -(x+4)^2 + 1$; taking a square root

$$\begin{array}{l} -1 \\ -1 \end{array} \quad \begin{array}{l} -1 \\ -1 \end{array}$$

$$\begin{array}{l} -1 = -(x+4)^2 \\ \sqrt{-1} = \sqrt{-(x+4)^2} \end{array} \quad \begin{array}{l} -4+1 = \boxed{-3} \\ -4-1 = \boxed{-5} \end{array}$$

$$\begin{array}{l} \pm 1 = x+4 \\ -4 \quad -4 \\ -4 \pm 1 = x \end{array}$$

26. $0 = x^2 + 6x + 8$; factoring

$$\begin{array}{l} 2 \cdot 4 = 8 \\ 2 + 4 = 6 \end{array} \quad \begin{array}{l} 0 = x^2 + 2x + 4x + 8 \\ 0 = (x+2)(x+4) \end{array}$$

$$\begin{array}{l} x \quad 2 \\ x \quad \boxed{x^2 \quad 2x} \\ 4 \quad \boxed{4x \quad 8} \end{array} \quad \begin{array}{l} x+2=0 \quad x+4=0 \\ \boxed{x=-2} \quad \boxed{x=-4} \end{array}$$

28. $y = x^2 + 4x - 21$; quadratic formula

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(1)(-21)}}{2(1)}$$

$$= \frac{-4 \pm \sqrt{16 + 84}}{2} = \frac{-4 \pm \sqrt{100}}{2} = \frac{-4 \pm 10}{2}$$

$$= \frac{-4+10}{2} = \frac{6}{2} = \boxed{3} = \frac{-4-10}{2} = \frac{-14}{2} = \boxed{-7}$$

30. $2(x-4)^2 + 3 = 9$; taking a square root

$$\begin{array}{l} -3 \quad -3 \end{array}$$

$$\frac{2(x-4)^2}{2} = \frac{6}{2}$$

$$\sqrt{(x-4)^2} = \sqrt{3}$$

$$\begin{array}{l} x-4 = \pm\sqrt{3} \\ +4 \quad +4 \end{array}$$

$$\boxed{x = 4 \pm \sqrt{3}}$$