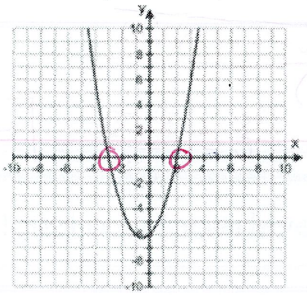
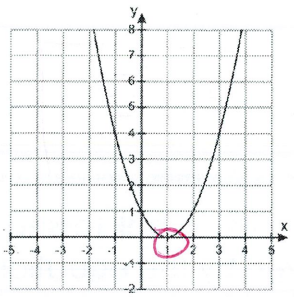
Name: Key Date: _____

Unit 3 Review #2

Solve each quadratic **Graphically**.

1. 

$x = -3, 2$

2. 

$x = 1$

Solve each quadratic equation by **Factoring**:

3. $3x^2 - 17x = 6$

$-6 \quad -6$

$3x^2 - 17x - 6 = 0$

$(3x+1)(x-6) = 0$

$3x+1=0 \quad | \quad x-6=0$

$3x=-1 \quad | \quad x=6$

$x=-\frac{1}{3} \quad | \quad x=6$

4. $2x^2 + 8x - 10 = 0$

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

$2(x+5)(x-1)=0$

$2=0 \quad | \quad x+5=0 \quad | \quad x-1=0$

Nope! $\quad | \quad x=-5 \quad | \quad x=1$

5. $20x^2 - 125 = 0$

$5(4x^2-25)=0$

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

$5=0 \quad | \quad 2x+5=0 \quad | \quad 2x-5=0$

Nope! $\quad | \quad 2x=-5 \quad | \quad 2x=5$

$x=-\frac{5}{2} \quad | \quad x=\frac{5}{2}$

Solve each quadratic equation by **Square Roots**:

6. $\frac{2}{5}x^2 - 63 = 13$

$+63 \quad +63$

$\frac{2}{5}x^2 = 76$

$\cdot 5 \qquad \cdot 5$

$\frac{2x^2}{2} = \frac{380}{2}$

$x^2 = 190$

$x = \pm\sqrt{190}$

7. $(x+2)^2 - 40 = 9$

$+40 \quad +40$

$\sqrt{(x+2)^2} = \sqrt{49}$

$x+2 = \pm 7$

$x = -2 \pm 7$

$x = 5, -9$

8. $2(x-3)^2 + 10 = 24$

$-10 \quad -10$

$\frac{2(x-3)^2}{2} = \frac{14}{2}$

$\sqrt{(x-3)^2} = \sqrt{7}$

$x-3 = \pm\sqrt{7}$

$x = 3 \pm \sqrt{7}$

Solve each quadratic equation by **Completing the Square**:

9. $x^2 + 4x - 12 = 0$

$x^2+4x = 12$

$x^2+4x+4 = 12+4$

$\sqrt{(x+2)^2} = \sqrt{16}$

$x+2 = \pm 4$

$x = -2 \pm 4$

$x = 2, -6$

10. $x^2 - 10x + 14 = 0$

$x^2 - 10x = -14$

$x^2 - 10x + 25 = -14 + 25$

$\sqrt{(x-5)^2} = \sqrt{11}$

$x - 5 = \pm\sqrt{11}$

$x = 5 \pm \sqrt{11}$

11. $x^2 + 8x + 4 = 0$

$x^2 + 8x = -4$

$x^2 + 8x + 16 = -4 + 16$

$\sqrt{(x+4)^2} = \sqrt{12}$

$x + 4 = \pm 2\sqrt{3}$

$x = -4 \pm 2\sqrt{3}$

Solve each quadratic equation by **the Quadratic Formula:** *Must be = 0

12. $x^2 + 3x + 1 = 0$

$a=1\ b=3\ c=1$

$\frac{-3 \pm \sqrt{(3)^2-4(1)(1)}}{2(1)} = \boxed{\frac{-3 \pm \sqrt{5}}{2}}$

13. $2x^2 - 28x = 4$

$-4 \quad -4$

$2x^2 - 28x - 4 = 0$ $\quad a=2\ b=-28\ c=-4$

$\frac{28 \pm \sqrt{(-28)^2-4(2)(-4)}}{2(2)} = \frac{28 \pm 4\sqrt{51}}{4} = \boxed{7 \pm \sqrt{51}}$

14. After t seconds, a ball tossed in the air from the ground level reaches a height of h feet given by the equation $h(t) = -16t^2 + 144t$.

a. What is the height of the ball at 3 second? $h(3) = -16(3)^2 + 144(3) = \boxed{288 ft}$

b. Find the number of seconds the ball is in the air when it reaches a height of 224 feet. $224 = -16t^2 + 144t$

$-224 \quad -224$

$\frac{-16t^2}{-16} + \frac{144t}{-16} - \frac{224}{-16} = 0 \rightarrow t^2 - 9t + 14 = 0$ (GCF)

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

$\boxed{t=2} \quad \boxed{t=7}$

The ball will reach 224 at 2 seconds and 7 seconds.

You could have also used quadratic formula on this one

c. After how many seconds will the ball hit the ground before rebound?

$0 = -16t^2 + 144t$ (GCF)

$\frac{}{-16t} \quad \frac{}{-16t}$

$0 = -16t(t-9)$

$\frac{-16t}{-16} = 0 \quad t-9=0$

$t=0 \quad +9 \quad +9$

$\boxed{t=9}$

The ball rebounded at 9 seconds

15. A rock is dropped from the top of a tall building, 382 feet high. The path, in feet, is given by $h(t) = -16t^2 + 382$. How long after the rock is thrown is it on the ground? $0 = -16t^2 + 382$

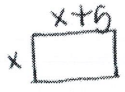
$-382 \quad -382$

$\frac{-382}{-16} = \frac{-16t^2}{-16}$

$\sqrt{23.875} = \sqrt{t^2}$

$t \approx 4.9$ seconds

16. The length of a rectangle is 5 cm more than the width. The area is 50 cm^2. Find the dimensions of the rectangle.



$x(x+5) = 50$

$x^2 + 5x = 50$

$-50 \quad -50$

$x^2 + 5x - 50 = 0$

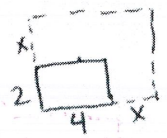
$(x+10)(x-5) = 0$

$x+10=0 \quad x-5=0$

$x=-10 \quad \boxed{x=5}$

Length: 10 cm
Width: 5 cm

17. The dimensions of a rectangular garden were 2 m by 4 m. Each dimension was increased by the same amount. The garden then had an area of 48 m^2. Find the dimensions of the new garden. (Hint: Let x be the amount of increase.)



$(x+2)(x+4) = 48$

$x^2 + 6x + 8 = 48$

$-48 \quad -48$

$x^2 + 6x - 40 = 0$

$(x+10)(x-4) = 0$

$x+10=0 \quad x-4=0$

$-10 \quad -10 \quad +4 \quad +4$

$x=-10 \quad \boxed{x=4}$

$2+4 = 6$

$4+4 = 8$

6m by 8m

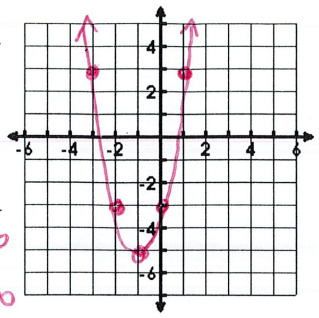
Graph the following equation. Then, write the characteristics for the graph.

18. $y = 2(x+1)^2 - 5$

- Vertex: $(-1, -5)$
- Axis of Sym.: $x = -1$
- Range: $[-5, \infty)$
- End Behavior: _____

$x \to \infty, f(x) \to \infty$

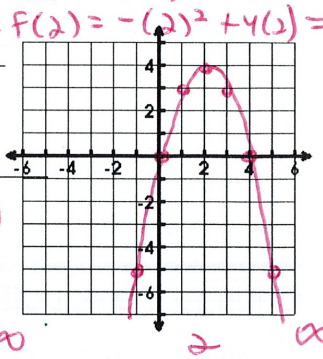
$x \to -\infty, f(x) \to \infty$



19. $y = -x^2 + 4x$ $h = \frac{-b}{2a} = \frac{-4}{2(-1)} = \frac{-4}{-2} = 2$

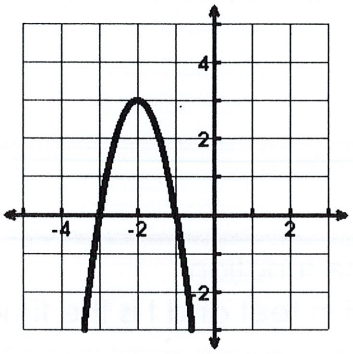
$k = f(2) = -(2)^2 + 4(2) = 4$

- Vertex: $(2, 4)$
- Axis of Sym.: $x = 2$
- Increasing: $(-\infty, 2)$
- Decreasing: $(2, \infty)$



$-\infty$ 2 ∞

20.



- Describe the transformations:
  - Reflected over the x-axis
  - V stretch of 3
  - Left 2
  - Up 3
- Write the equation in vertex form: $y = -3(x+2)^2 + 3$
- Roots: $x = -3, -1$

Describe the transformations to the parent function in the given equations.

Function	a	h	k
21. $-f(x+2)-5$	$a = -1$ Reflected over the x-axis	$h = -2$ Left 2	$k = -5$ Down 5
22. $3f(x-4)+2$	$a = 3$ V. stretch of 3	$h = 4$ Right 4	$k = 2$ Up 2
23. $\frac{1}{2}f(x)-1$	$a = \frac{1}{2}$ V. shrink of $\frac{1}{2}$	$h = 0$ None	$k = -1$ Down 1
24. $-f(x-2)$	$a = -1$ Reflected over the x-axis	$h = 2$ Right 2	$k = 0$ None

Solve using any method.

25. $x^2 - 14x = -10$

$x^2 - 14x + 49 = -10 + 49$

$(x-7)^2 = 39$

$x - 7 = \pm\sqrt{39}$

$x = 7 \pm \sqrt{39}$

Change the equations to standard form.

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

$2(x^2-2x+1)+4$

$2x^2-4x+2+4$

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

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

$f(x) = -(x^2+8x+16)-6$

$f(x) = -x^2-8x-16-6$

$f(x) = -x^2-8x-22$

Change the equations to vertex form.

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

$a = -3 \quad b = 6 \quad c = -2$

$h = \frac{-6}{-6} = 1$

$K = 1$

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

12. $y = 2x^2 + 8x + 1$

$a = 2 \quad b = 8 \quad c = 1$

$h = -2$

$K = -7$

$y = 2(x+2)^2-7$

An object is projected into the air with a path described by the function $h(t) = -16t^2 + 96t + 160$ where h is the height above the ground in feet and t is the time in seconds since the object started along the path.

13. Find the time the object changes direction. (vertex)

(h) $x =$ 3 sec

14. Find the maximum height of the object. (vertex)

(k) $y =$ 304 ft

15. Describe the location of the object at 2.5 seconds.

$h(2.5) = -16(2.5)^2 + 96(2.5) + 160 =$ 300 ft

The height, in meters, of a ball as it falls at a given time (x), in seconds, can be found using the equation $f(x) = -4x^2 + 36$.

16. At what height does the ball **start**?

$f(0) = -4(0)^2 + 36 =$ 36 m

17. When does the ball hit the **ground**?

$-4x^2 + 36 = 0$

$-4x^2 = -36$

$\sqrt{x^2} = \sqrt{9}$

$x = 3, -3$

3 seconds