

Unit 5 Quadratic Function Review Algebra 2 NAME: _____ Date: _____

$$4(x - (-3))^2 - 1$$

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

Graph the functions (5 points and AoS)

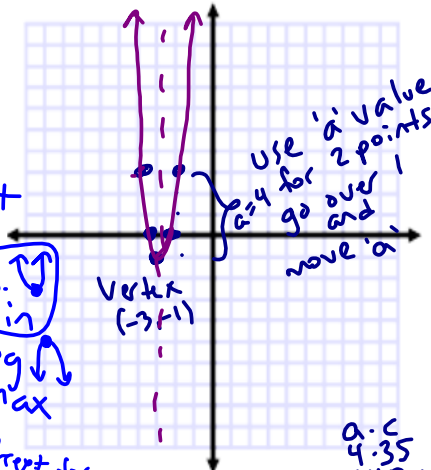
What form is this equation written in? **Vertex**
 1 pair of $()^2$

What is the form/equation using a,b,c,h,k,q or p: $a(x-h)^2 + k$

What is the Axis of symmetry of this equation: $x = -3$ $h = -3$

What is the VERTEX of this equation: $(-3, -1)$ $k = -1$ Min or Max **Min**

Domain: $-\infty < x < \infty$ Range: $-1 < y < \infty$ look at 'a'



When $x = 0$ \rightarrow $(0, 35)$
 So plug in $x = 0$ and solve for y
 x -intercepts: $x = -3.5$ $x = -2.5$

$y = 4(0 + 3)^2 - 1$
 $y = 4(3)^2 - 1 \rightarrow y = 36 - 1$
 $y = 4(9) - 1 \rightarrow y = 35$

$2x + 7 = 0$ $2x + 5 = 0$
 $-7 - 7$ $-5 - 5$
 $\frac{2x}{2} = \frac{-7}{2}$ $\frac{2x}{2} = \frac{-5}{2}$
 $x = -\frac{7}{2}$ $x = -\frac{5}{2}$
 put into standard form then factor for intercept form then set each factor = 0 and solve for x

Function in Standard Form:

$4(x + 3)^2 - 1$
 rewrite expand multiply combine like terms
 $4(x + 3)(x + 3) - 1$
 $4(x^2 + 3x + 3x + 9) - 1$

Function in Intercept Form:

$4(x^2 + 6x + 9) - 1$
 $4x^2 + 24x + 36 - 1$
 $y = 4x^2 + 24x + 35$

$4x^2 + 24x + 35$
 $(x + 14)(x + 10)$
 $y = 4(x + \frac{1}{2})(x + \frac{5}{2})$
 $y = (2x + 7)(2x + 5)$

$\begin{array}{r} a \cdot c \\ 4 \cdot 35 \\ 140 \\ \times 10 \\ \hline 140 \\ + 40 \\ \hline 180 \end{array}$
 \div by a simplify bottoms up

2. $F(x) = -\frac{1}{2}x^2 - 2x + 5$

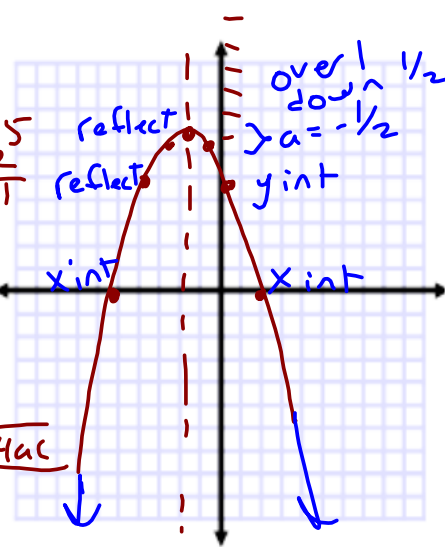
What form is this equation written in? **Standard Form**

What is the form/equation using a,b,c,h,k,q or p: $ax^2 + bx + c$

What is the Axis of symmetry of this equation: $x = -2$ $a = -\frac{1}{2}$ $b = -2$ $c = 5$

What is the VERTEX of this equation: $(-2, 7)$ $x = \frac{-(-2)}{2(-\frac{1}{2})} = \frac{2}{-1} = -2$ Min or Max **max**

Domain: $-\infty < x < \infty$ Range: $-\infty < y \leq 7$ is neg



Plug in $x = 0$ to get y value
 $y = -\frac{1}{2}(0)^2 - 2(0) + 5$
 $y = 5$
 $(0, 5)$
 $(0, 4)$

x -intercepts: $x = -5.742$ $x = 1.741$

Try Factoring if doesn't work use quadratic Formula
 $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(-\frac{1}{2})(5)}}{2(-\frac{1}{2})}$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Function in Vertex Form: $a(x-h)^2 + k$
 $a = -\frac{1}{2}$ $h = -2$ $k = 7$
 $y = -\frac{1}{2}(x - (-2))^2 + 7$
 $y = -\frac{1}{2}(x + 2)^2 + 7$

Function in Intercept Form: $a(x-p)(x-q)$
 $-\frac{1}{2}(x - 5.742)(x - 1.741)$
 $y = -\frac{1}{2}(x + 5.742)(x - 1.741)$

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3. $g(x) = -2(x-3)(x+1)$

Graph the functions (5 points and AoS)

What form is this equation written in? intercept

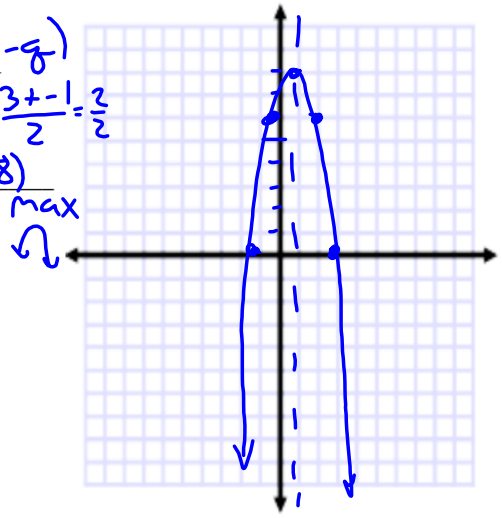
What is the form/equation using a,b,c,h,k,q or p : $a(x-p)(x-q)$

What is the Axis of symmetry of this equation $(p+q/2)$: $x = \frac{3+(-1)}{2} = \frac{2}{2}$

What is the VERTEX of this equation (plug in A.o.S to find y): $(1, 8)$

Domain: $-\infty < x < \infty$ Range: $-\infty < y \leq 8$

Interval Negative: $-\infty < x < -1 \cup 3 < x < \infty$
 Interval Increasing: $-\infty < x < 1$ left to right
 y-intercept (plug in 0 for x, solve for y): $(0, 6)$



x-intercepts (set factors = 0 and solve for x): $(3, 0)$ $(-1, 0)$

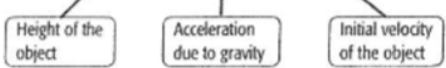
Function in Standard Form (distribute):

Function in Vertex Form (use vertex found and the a value):

$-2(x-3)(x+1)$
 $-2(x^2 + 1x - 3x - 3)$
 $-2(x^2 - 2x - 3) \rightarrow y = -2x^2 + 4x + 6$

$y = -2(x-1)^2 + 8$
 $a = -2$ $h = 1$ $k = 8$

$H(t) = -\frac{1}{2}gt^2 + vt + h$ Initial height of the object



Gravity:
 in feet is 32 ft/sec²
 in meters is 9.8 m/s²

EXERCISES

1. Darren swings at a golf ball on the ground with a velocity of 10 feet per second. How long was the ball in the air? about 0.625 s
 $v = 10$
 $g = 32$

2. Amalia hits a volleyball at a velocity of 15 meters per second. If the ball was hit from a height of 1.8 meters, determine the time it takes for the ball to land on the floor. Assume that the ball is not hit by another player. about 3.2 s

3. Michael is repairing the roof on a shed. He accidentally dropped a box of nails from a height of 14 feet. How long did it take for the box to land on the ground? Since the box was dropped and not thrown, $v = 0$. about 0.94 s

4. Carmen threw a penny into a fountain. She threw it from a height of 1.2 meters and at a velocity of 6 meters per second. How long did it take for the penny to hit the surface of the water? about 0.17 s $t = ?$

$h = 1.2$ $v = -6$ $H(t) = 0$ $g = 9.8$
 $H(t) = -\frac{1}{2}(9.8)t^2 - 6t + 1.2$
 $0 = -4.9t^2 - 6t + 1.2$
 $a = -4.9$ $b = -6$ $c = 1.2$
 $t = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(-4.9)(1.2)}}{2(-4.9)}$
 $t = \frac{6 \pm \sqrt{59.52}}{-9.8}$
 $t = \frac{6 + \sqrt{59.52}}{-9.8}$ $t = \frac{6 - \sqrt{59.52}}{-9.8}$
 ~~$t = -1.39$~~ $t = 0.175 \text{ sec}$

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7. Ameen kicked a soccer ball and it's height can be modeled by the function

$f(x) = -16x^2 + 20x + 0.5$ where x is time in seconds and $f(x)$ is the height above the ground in feet.

a. Based on this model we know that the max height is 6.75 ft and it occurs at time $x = 0.625$ sec
 $x = \frac{-b}{2a} = \frac{-(20)}{2(-16)} = \frac{-20}{-32} = 0.625$ Plug in x value to get y value
 Vertex $(0.625, 6.75)$

b. What is the height that Ameen kicked the ball from? 0.5 ft
 $f(0.625) = -16(0.625)^2 + 20(0.625) + 0.5$
 $f(0.625) = 6.75$

d. When did the ball hit the ground? $x = ?$ $f(x) = 0$
 e. When is the ball at the height of 20 feet? $x = ?$ $f(x) = 20$

Use Quad Formula
 $0 = -16x^2 + 20x + 0.5$
 $a = -16$
 $b = 20$
 $c = 0.5$
 $x = \frac{-20 \pm \sqrt{20^2 - 4(-16)(0.5)}}{2(-16)}$
 $x = \frac{-20 \pm \sqrt{400 - 32}}{-32}$
 $x = \frac{-20 \pm \sqrt{368}}{-32}$
 $x = 0.625$

$20 = -16x^2 + 20x + 0.5$
 -20
 $0 = -16x^2 + 20x - 19.5$
 Never, the max height is 6.75 ft
 Equation must = 0 to factor or use Quad Formula

f. The distance of Ameen's kick can be modeled by this new function $H(x) = -0.11x^2 + 2.1x$, where x is the distance from the starting point, and $H(x)$ is the height of the ball. How close or close/far away can Ameen stand from the 6ft goal for him to be able to score?

8. The discriminant formula is: $b^2 - 4ac$ (the part under $\sqrt{\quad}$)

9. What will the parabola graph look like if...

a. The function has a Negative Discriminant is:

$\sqrt{-\#} = \pm i$ 2 complex Imaginary answers no x -int



b. The function has a Positive Discriminant is:

$\sqrt{+\#} = \pm$ 2 Real solutions Rational or Irrational



c. The function has a Discriminant of 0 is:

$\sqrt{0} = \pm 0 = 0$ 1 Real Solution $-\frac{b}{2a}$ Vertex on x -axis



2 x int



(crosses) x axis one time

Unit 5 Quadratic Function Review Algebra 2 NAME: _____ Date: _____

Factor and Solving Review LET'S GET GOOD AT THIS!

Name: _____

You will be factoring or solving all the expressions or equations by factoring. The skills are all mixed, you will need to decide which skills are being applied and which to use.

10. $30a^4b^3c - 18a^3b^2c^2$

11. $p^2 - 14p - 32 = 0$

12. $7t^2 + 17t - 12 = 0$

13. $12x^2 + 9x = 0$

$3x(4x + 3) = 0$
 $\frac{3x}{3} = 0 \quad 4x + 3 = 0$
 $x = 0 \quad 4x = -3$
 $x = -\frac{3}{4}$

$a(x-p)(x-q)$
 $12(x)(x + \frac{3}{4})$

14. $y^2 + y = 56$

15. $49x^2 - 1 = 0$

$(7x+1)(7x-1) = 0$
 $7x+1=0 \quad 7x-1=0$
 $x = -\frac{1}{7} \quad x = \frac{1}{7}$

Diff. of Squares
 $\sqrt{49x^2} = 7x$
 $\sqrt{1} = 1$

16. $27x^2 - 18x = -3$

17. $5m^2 = 16p - 15$

18. $x^2 - 100$

19. $-121x^2 - 64$

$-1(121x^2 + 64)$
 $-1(11x + 8i)(11x - 8i)$
 $x = \pm \frac{8}{11}i$

Sum of Squares
 $\sqrt{121x^2} = 11x$
 $\sqrt{64} = 8$
 $\pm i$

20. $12x^4yz^2 - 24x^2y^3z^3 + 18x^2yz^3$

21. $63g^3 + 252g = 0$

22. $49x^2 + 42x + 16 = 11$

23. $8p^2 - 10p - 18 = 0$

Unit 5 Quadratic Function Review Algebra 2 NAME: Key Date: _____

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

Graph the functions (5 points and AoS)

What form is this equation written in? Vertex

What is the form/equation using a,b,c,h,k,q or p: $a(x-h)^2 + k$

What is the Axis of symmetry of this equation: $x = -3$

What is the VERTEX of this equation: $(-3, -1)$ Min or Max Min

Domain: $-\infty < x < \infty$ or $x \in (-\infty, \infty)$ Range: $-1 \leq y < \infty$ or $y \in [-1, \infty)$

y-intercept: $(0, 35)$ $y = 4(0+3)^2 - 1$ Plug in 0 for x
 $y = 4(3)^2 - 1 = 35$

x-intercepts: $(-2.5, 0), (-3.5, 0)$
 $0 = 4(x+3)^2 - 1$ Plug in 0 for y
 $+1 = 4(x+3)^2$ $\frac{1}{4} = (x+3)^2$ $x = -3 \pm \frac{1}{2}$
 $\frac{1}{4} = 4(x+3)^2$ $+\frac{1}{2} = x+3$ $x = -3 + \frac{1}{2}$ $x = -3 - \frac{1}{2}$
 $-3 = x - 3$ $x = -2.5$ $x = -3.5$

Function in Standard Form:

$$4(x+3)(x+3) - 1$$

$$4(x^2 + 6x + 9) - 1$$

$$4x^2 + 24x + 36 - 1$$

$$y = 4x^2 + 24x + 35$$

Function in Intercept Form:

$$4(x+2.5)(x+3.5)$$

$$4(x + \frac{5}{2})(x + \frac{7}{2})$$

$$y = (2x+5)(2x+7)$$

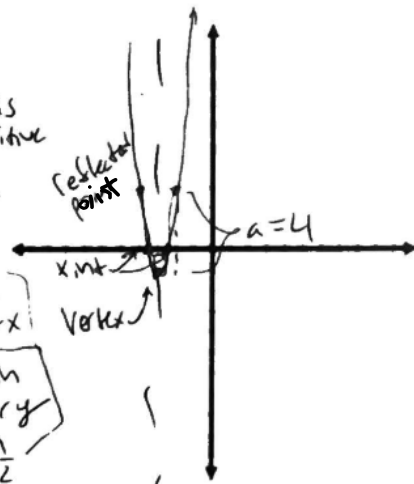
$$4x^2 + 24x + 35$$

$$(x+14)(x+2.5)$$

$$(x + \frac{1}{4})(x + \frac{5}{2})$$

$$(2x+7)(2x+5)$$

$$\begin{array}{r} 4 \cdot 35 \\ 140 \\ \times 10 \\ \hline 24 \end{array}$$



2. $F(x) = -1/2 x^2 - 2x + 5$

Graph the functions (5 points and AoS)

What form is this equation written in? Standard $y = 4(x+2.5)(x+3.5)$

What is the form/equation using a,b,c,h,k,q or p: $ax^2 + bx + c$

What is the Axis of symmetry of this equation: $x = \frac{-b}{2a} = \frac{-(-2)}{2(-1/2)} = \frac{2}{-1} = -2 = x$

What is the VERTEX of this equation: $(-2, 7)$ Min or Max Max

Domain: $-\infty < x < \infty$ or $x \in (-\infty, \infty)$ Range: $-\infty < y \leq 7$ or $y \in (-\infty, 7]$ a is negative

y-intercept: $(0, 5)$

x-intercepts: $(-5.74, 0), (-1.74, 0)$

$-2(0 \pm (-\frac{1}{2}x^2 - 2x + 5)) = -2$

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

$0 =$ Not Factorable use Quadratic Formula

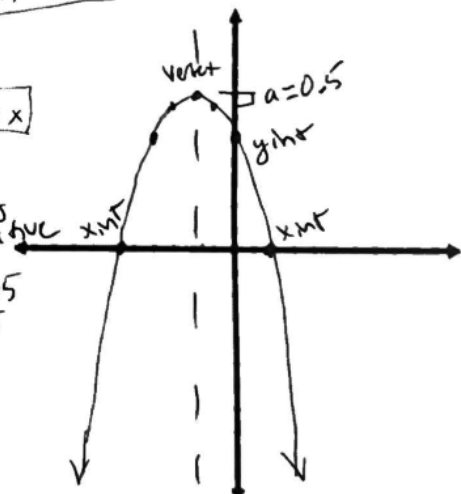
$$f(-2) = -\frac{1}{2}(-2)^2 - 2(-2) + 5$$

$$y = -\frac{1}{2} \cdot 4 + 4 + 5$$

$$y = -2 + 4 + 5$$

$$y = 2 + 5$$

$$f(-2) = 7$$



Function in Standard Form:

$$y = -\frac{1}{2}(x+2)^2 + 7$$

Plug in a and vertex

Function in Intercept Form:

$$y = -\frac{1}{2}(x+5.74)(x-1.74)$$

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

$$x = \frac{2 \pm \sqrt{4 + 10}}{-1}$$

$$x = 2 + \sqrt{14} \quad x = 2 - \sqrt{14}$$

$$x = -5.74 \quad x = 1.74$$

3. $g(x) = -2(x-3)(x+1)$

Graph the functions (5 points and AoS)

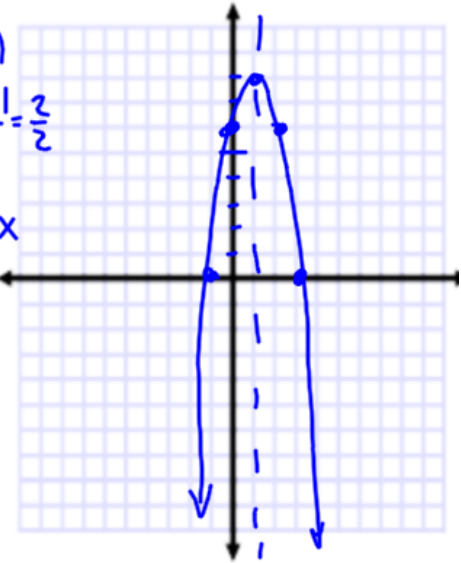
What form is this equation written in? intercept

What is the form/equation using a,b,c,h,k,q or p: $a(x-p)(x-q)$

What is the Axis of symmetry of this equation (p+q/2): $x = \frac{3+(-1)}{2} = \frac{2}{2}$

What is the VERTEX of this equation (plug in A.o.S to find y): (1,8)

Domain: $-\infty < x < \infty$ Range: $-\infty < y \leq 8$



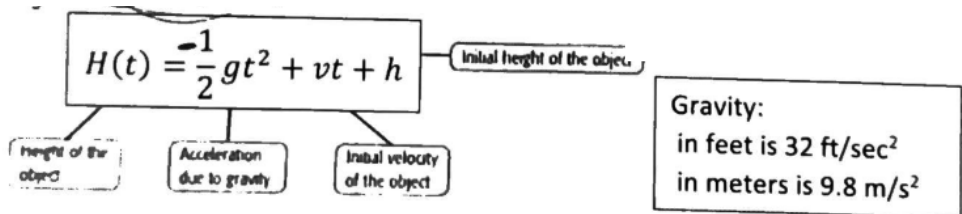
where function is below x axis: $-\infty < x < -1 \cup 3 < x < \infty$
 where function is getting bigger: $-\infty < x < 1$ left to right

y-intercept (plug in 0 for x, solve for y): (0, -6)

x-intercepts (set factors = 0 and solve for x): (3, 0) (-1, 0)

Function in Standard Form (distribute):
 $-2(x-3)(x+1)$
 $-2(x^2+1x-3x-3)$
 $-2(x^2-2x-3) \rightarrow y = -2x^2+4x+6$

Function in Vertex Form (use vertex found and the a value):
 $y = -2(x-1)^2 + 8$
 $a = -2$ $h = 1$ $k = 8$



- EXERCISES**
- Darren swings a golf ball on the ground with a velocity of 10 feet per second. How long was the ball in the air? about 0.625 s
 $H(t) = 0$ $v = 10$ $g = 32 \text{ ft/sec}^2$
 $0 = -\frac{1}{2}(32)t^2 + 10t + 0$ $h = 0$ golf ball starts on ground
 $0 = -16t^2 + 10t + 0 \rightarrow 0 = -2t(8t-5)$ $t = \frac{-10 \pm 10}{-32}$ $t = \frac{-10-10}{-32}$
 $t = \frac{-10 \pm \sqrt{100}}{-32}$ $t = 0$ $t = 0.625$ seconds
 - Amalia hits a volleyball at a velocity of 15 meters per second. If the ball was hit from a height of 1.8 meters, determine the time it takes for the ball to land on the floor. Assume that the ball is not hit by another player. about 3.7 s
 $0 = \frac{1}{2}(9.8)t^2 + 15t + 1.8$ $v = 15$ $y = 9.8$ $h = 1.8$ $H(0) = 0$
 $0 = -4.9t^2 + 15t + 1.8$
 $a = -4.9$ $b = 15$ $c = 1.8$
 $t = \frac{-15 \pm \sqrt{(15)^2 - 4(-4.9)(1.8)}}{2(-4.9)}$ $t = \frac{-15 \pm \sqrt{260.28}}{-9.8}$ $t = -2.1156$
 $t = \frac{-15 + 16.13}{-9.8}$ $t = \frac{-15 + 16.13}{-9.8}$ $t = 3.177$ about 3.2 seconds
 - Michael is repairing the roof on a shed. He accidentally dropped a box of nails from a height of 14 feet. How long did it take for the box to land on the ground? Since the box was dropped and not thrown, $v = 0$. about 0.84 s
 $h = 14$ $v = 0$ $g = 32$
 $0 = -\frac{1}{2}(32)t^2 + 0t + 14$ $a = -16$ $b = 0$ $c = 14$
 $0 = -16t^2 + 14$ OR $t = \frac{-0 \pm \sqrt{0^2 - 4(-16)(14)}}{2(-16)}$
 $-14 = t^2$ $t = \pm \sqrt{\frac{14}{16}} = 0.935$ $t = \frac{\pm \sqrt{896}}{-32}$ $t = \pm 0.935$
 - Carmen threw a penny into a fountain. She threw it from a height of 1.2 meters and at a velocity of 6 meters per second. How long did it take for the penny to hit the surface of the water? about 0.77 s
 $h = 1.2$ $v = 6$ $g = 9.8$ $H(t) = 0$
 $0 = -\frac{1}{2}(9.8)t^2 + 6t + 1.2$ $t = \frac{-6 \pm \sqrt{(6)^2 - 4(-4.9)(1.2)}}{2(-4.9)}$
 $0 = -4.9t^2 + 6t + 1.2$ $t = \frac{-6 \pm \sqrt{54.52}}{-9.8}$ $t = 0.77$

7. JP kicked a soccer ball and it's height can be modeled by the function

$f(x) = -16x^2 + 20x + 0.5$ where x is time in seconds and $f(x)$ is the height above the ground in feet.

a. Based on this model we know that the max height is 6.75 ft and it occurs at time $x = 0.625$ seconds

Vertex $x = \frac{-b}{2a} = \frac{-20}{2(-16)} = 0.625$ $f(0.625) = -16(0.625)^2 + 20(0.625) + 0.5 = 6.75$

b. What is the height that JP kicked the ball from? 0.5 ft

$y = 6.75$

d. When did the ball hit the ground? $f(x) = 0$

$0 = -16x^2 + 20x + 0.5$
 $a = -16$ $b = 20$ $c = 0.5$
 $x = \frac{-20 \pm \sqrt{20^2 - 4(-16)(0.5)}}{2(-16)}$
 $x = \frac{-20 \pm \sqrt{432}}{-32}$
 $x = \frac{-20 + 20.78}{-32}$ $x = \frac{-20 - 20.78}{-32}$
 $x = -0.2245$ $x = 1.275$ seconds

e. When is the ball at the height of 20 feet?

$20 = -16x^2 + 20x + 0.5$
 $0 = -16x^2 + 20x - 19.5$
 $a = -16$ $b = 20$ $c = -19.5$
 $x = \frac{-20 \pm \sqrt{20^2 - 4(-16)(-19.5)}}{2(-16)}$
 $x = \frac{-20 \pm \sqrt{-848}}{-32} \rightarrow$ imaginary
 never, the ball never reached a height


f. The distance of JP's kick can be modeled by $H(x) = -0.11x^2 + 2.1x$, where x is the distance from the starting point, and $H(x)$ is the height of the model. How close or far away can the goal be that is 6ft tall for the ball to be able to score?

$6 = -0.11x^2 + 2.1x$
 $0 = -0.11x^2 + 2.1x - 6$
 $a = -0.11$ $b = 2.1$ $c = -6$
 $x = \frac{-2.1 \pm \sqrt{2.1^2 - 4(-0.11)(-6)}}{2(-0.11)}$
 $x = \frac{-2.1 \pm 1.330}{-0.22}$
 $x = 3.5$ and $x = 15.591$
 he needs to be closer than 3.5 ft or further than 15.591 ft from the goal to score. Otherwise the ball would go over


8. The discriminant formula is: $b^2 - 4ac$ the part under radical

9. What will the parabola graph look like if...

a. The function has a Negative Discriminant is:

$b^2 - 4ac < 0$ $\sqrt{\#}$  no x intercepts

b. The function has a Positive Discriminant is:

$b^2 - 4ac > 0$ $\sqrt{\#}$  2 x intercepts

c. The function has a Discriminant of 0 is:

$b^2 - 4ac = 0$ $\sqrt{0}$  1 x intercepts

Unit 5 Quadratic Function Review Algebra 2 NAME: _____ Date: _____

Factor and Solving Review LET'S GET GOOD AT THIS! Name: _____

You will be factoring or solving all the expressions or equations by factoring. The skills are all mixed, you will need to decide which skills are being applied and which to use.

10. $30a^4b^3c - 18a^3b^2c^2$
 $6a^3b^2c(5ab - 3c)$ GCF

11. $p^2 - 14p - 32 = 0$
 $(p-16)(p+2) = 0$
 $p-16=0$ $p+2=0$
 $p=16$ $p=-2$

12. $7t^2 + 17t - 12 = 0$
 $7t^2 + 21t - 4t - 12 = 0$
 $7t(t+3) - 4(t+3) = 0$
 $(t+3)(7t-4) = 0$
 $t+3=0$ $7t-4=0$
 $t=-3$ $t=4/7$

7:12 Bottoms Up
 $(t-2)(t-4)$
 $(t-3)(7t-4)$

13. $12x^2 + 9x = 0$
 $3x(4x+3) = 0$ GCF
 $3x=0$ $4x+3=0$
 $x=0$ $x=-3/4$

14. $y^2 + y = 56$
 $y^2 + y - 56 = 0$
 $(y+8)(y-7) = 0$
 $y+8=0$ $y-7=0$
 $y=-8$ $y=7$

15. $49x^2 - 1 = 0$ Difference of Squares
 $(7x-1)(7x+1) = 0$
 $7x-1=0$ $7x+1=0$
 $x=1/7$ $x=-1/7$

16. $27x^2 - 18x = -3$
 $27x^2 - 18x + 3 = 0$
 $3(9x^2 - 6x + 1) = 0$
 $3(3x-1)(3x-1) = 0$
 $3x-1=0$ $3x-1=0$
 $x=1/3$ twice

Bottoms Up
 $3(x-1/3)(x-1/3)$
 $3(3x-1)(3x-1)$

17. $5m^2 = 16p - 15$
 $5m^2 - 16p + 15 = 0$
 Not factorable
 Quad Formula
 $m = \frac{-(-16) \pm \sqrt{(-16)^2 - 4(5)(15)}}{2(5)}$
 $m = \frac{16 \pm \sqrt{256 - 300}}{10}$
 $m = \frac{16 \pm \sqrt{-44}}{10}$
 $m = 1.6 \pm 0.6633i$
 $m = 1.6 - 0.6633i$

18. $x^2 - 100$ Difference of Squares
 $(x-10)(x+10)$

19. $-121x^2 - 64$ Sum of Squares
 $-1(121x^2 + 64)$
 $-1(11x+8i)(11x-8i)$

20. $12x^4yz^2 - 24x^2y^3z^3 + 18x^2yz^3$
 $6x^2yz^2(2x^2 - 4y^2z + 3z)$ GCF

21. $63g^3 + 252g = 0$
 $63g(g^2 + 4) = 0$
 $g=0$ $g^2 + 4 = 0$
 $g^2 = -4$
 $g = \pm \sqrt{-4}$
 $g = 2i$ $g = -2i$

22. $49x^2 + 42x + 16 = 11$
 $49x^2 + 42x + 5 = 0$
 $(x+3/7)(x+5/7)$
 $(x+5/7)(x+1/7)$

23. $8p^2 - 10p - 18 = 0$
 $6^2 - 4ac = 784$
 Perfect square, so factorable
 $(7x+5)(7x+1) = 0$
 $x = -5/7$ $x = -1/7$

Sum of Squares
 $(g+2i)(g-2i) = 0$
 $g = 2i$ $g = -2i$