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: $x = -3$ ($x = h$)

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

a is positive

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

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

x-intercepts: $(-2.5, 0)(-3.5, 0)$

$0 = 4(x+3)^2 - 1$ $+1 \quad +1$

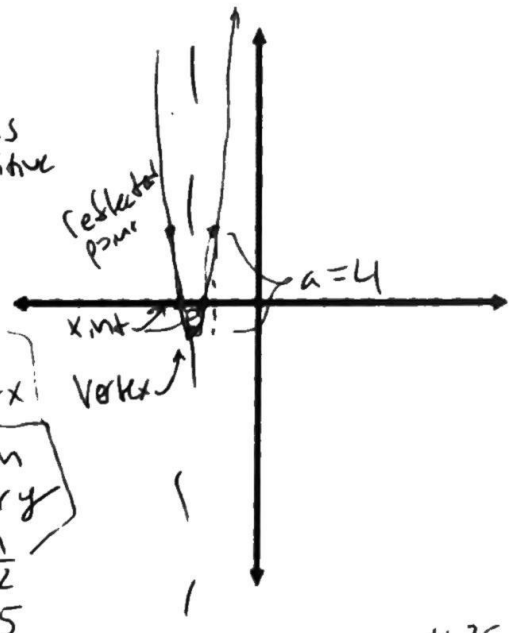
$\frac{1}{4} = \frac{4(x+3)^2}{4}$ $\frac{1}{4} = (x+3)^2$

$\pm\frac{1}{2} = x + 3$ $-3 \quad -3$

Plug in 0 for y

$x = -3 + \frac{1}{2}$ $x = -3 - \frac{1}{2}$

$x = -2.5$ $x = -3.5$



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:

$4(x+2.5)(x+3.5)$ or $(x+\frac{5}{2})(x+\frac{7}{2})$

$y = (2x+5)(2x+7)$ or $y = 4(x+2.5)(x+3.5)$

$4x^2 + 24x + 35$

$(x + \frac{14}{4})(x + \frac{10}{4})$

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

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

4·35 = 140; 14 + 10 = 24

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

Graph the functions (5 points and AoS)

What form is this equation written in? Standard

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: $x = \frac{-b}{2a}$ $x = \frac{-(-2)}{2(-\frac{1}{2})} = \frac{2}{-1} = -2 = x$

What is the VERTEX of this equation: $(-2, 7)$ $(\frac{-b}{2a}, f(\frac{-b}{2a}))$ Min or Max Max

a is negative

Domain: $-\infty < x < \infty$ or $x \in (-\infty, \infty)$ Range: $-\infty < y \le 7$ $y \in (-\infty, 7]$

y-intercept: $(0, 5)$ $(0, c)$

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

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

$y = -2 + 4 + 5$

$y = 2 + 5$

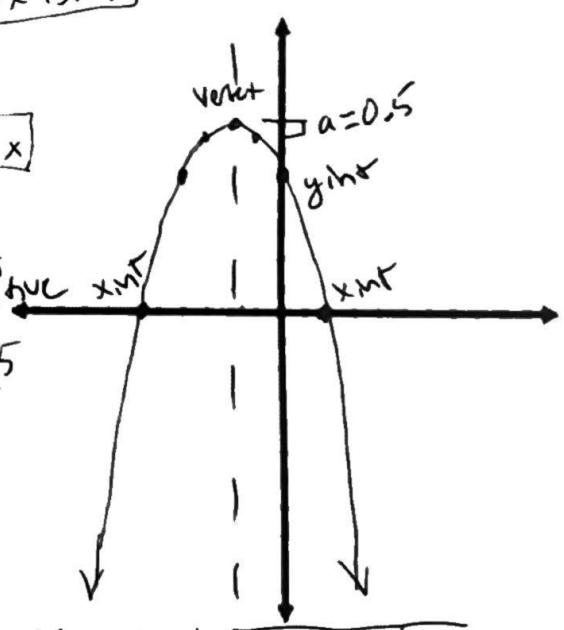
$f(-2) = 7$

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

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

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

0 = Not Factorable use Quadratic Formula



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

$x = \frac{2 \pm \sqrt{14}}{-1}$

$x = \frac{2 + \sqrt{14}}{-1}$ $x = -5.74$

$x = \frac{2 - \sqrt{14}}{-1}$ $x = 1.74$

Function in ~~Standard~~ Vertex Form:

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

Plug in a and vertex

Function in Intercept Form:

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

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

3. $g(x) = -4(x-3)(x+1)$

What form is this equation written in? x intercept

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

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

What is the VERTEX of this equation: (1, 16) Min or (Max) max a is negative

Domain: $x \in (-\infty, \infty)$ Range: $y \in (-\infty, 16]$

Interval Negative: $-\infty < x < -1 \;||\; 3 < x < \infty$ $f(1) = -4(1-3)(1+1)$

Interval Increasing: $-\infty < x < 1$ $y = -4(-2)(2)$ $y = 8 \cdot 2$ $f(1) = 16$

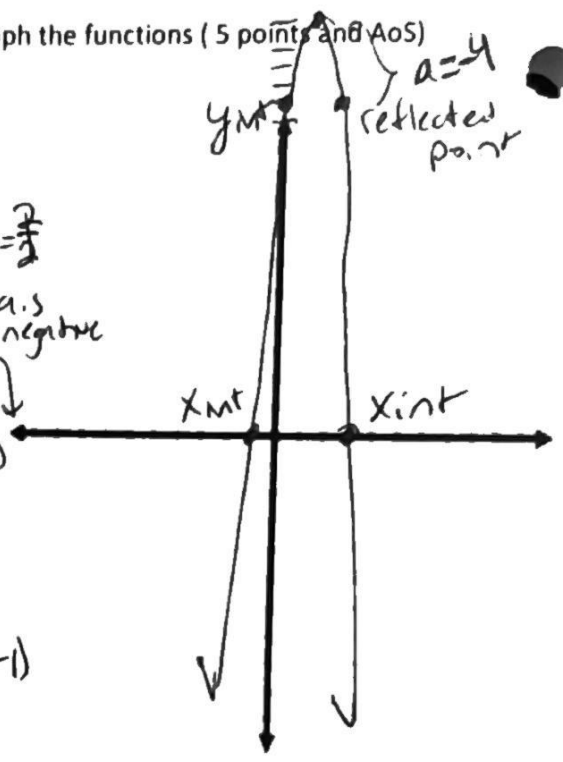
y-intercept: (0, 12)

x-intercepts: (3,0) (-1,0) $f(0) = -4(0-3)(0+1)$ $y = -4(-3)(1)$ $f(0) = 12$

$x-3=0$ $x+1=0$

$x=3$ $x=-1$

Graph the functions (5 points and AoS)



Function in Standard Form:

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

$y = -4(x^2+1x-3x-3)$ $y = -4x^2+8x+12$

$y = -4(x^2-2x-3)$

Function in Vertex Form:

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

plug in a; plug in (h,k) vertex

$$H(t) = \frac{-1}{2}gt^2 + vt + h$$

- $H(t)$: height of the object
- g: Acceleration due to gravity
- v: Initial velocity of the object
- h: Initial height of the object

Gravity:
in feet is 32 ft/sec^2
in meters is 9.8 m/s^2

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

$V=10$ $H(t)=0$ when it hit the ground $H=0$ $g=32\frac{ft}{sec^2}$ $h=0$ golf ball starts on ground

$H(t)=0$ $0=-\frac{1}{2}(32)t^2+10t+0$ $0=-16t^2+10t+0$ $0=-2t(8t-5)$

$a=16$ $b=10$ $c=0$ $t=\frac{-(10)\pm\sqrt{(10)^2-4(16)(0)}}{2(16)}$ $t=\frac{-10+10}{-32}$ $t=\frac{-10-10}{-32}$

$t=\frac{-10\pm\sqrt{100}}{-32}$ $t=0$ $t=0.625$ seconds

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

$V=15$ $y=9.8$ $h=1.8$ $H(t)=0$

$0=-\frac{1}{2}(9.8)t^2+15t+1.8$

$0=-4.9t^2+15t+1.8$

$a=-4.9$ $b=15$ $c=1.8$ $t=\frac{-15\pm\sqrt{(15)^2-4(-4.9)(1.8)}}{2(-4.9)}$

$t=\frac{-15\pm\sqrt{260.28}}{-9.8}$ $t=-0.1156$ $t=3.177$

$t=\frac{-15+16.13}{-9.8}$ $t=\frac{-15-16.13}{-9.8}$ about 3.2 seconds

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

$h=14$ $V=0$ $H(t)=0$ $g=32$

$0=-\frac{1}{2}(32)t^2+0t+14$ $a=16$ $b=0$ $c=14$

$0=-16t^2+14$ OR $t=\frac{-0\pm\sqrt{0^2-4(-16)14}}{2(-16)}$

$\frac{-14}{-16}=t^2$

$t=\pm\sqrt{7/8}=0.935$ $t=\pm\frac{\sqrt{896}}{-32}$ $t=\pm 0.935$

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 for the penny to hit the surface of the water? about 0.17 s

throwing down $\rightarrow V$ is $(-)$

$h=1.2$ $V=-6$ $g=9.8$ $H(t)=0$?

$0=-\frac{1}{2}(9.8)t^2-6t+1.2$

$0=-4.9t^2+6t+1.2$

$a=-4.9$ $b=6$ $c=1.2$

$t=\frac{+6\pm\sqrt{(6)^2-4(-4.9)(1.2)}}{2(-4.9)}$

$t=\frac{+6\pm\sqrt{59.52}}{-9.8}$ $t=+0.175$ $t=1.40$

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

$y = 6.75$

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

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

$0 = -16x^2 + 20x + 0.5$

$a = -16$ $b = 20$ $c = 0.5$

$x = \frac{-(20) \pm \sqrt{(20)^2 - 4(-16)(0.5)}}{2(-16)}$

$x = \frac{-20 \pm \sqrt{432}}{-32}$

$x = \frac{-20 + 20.78}{-32}$ $x = -0.0245$

$x = \frac{-20 - 20.78}{-32}$ $x = 1.275$ seconds

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

$20 = -16x^2 + 20x + 0.5$ $h = 20$

$-20 \quad -20$

$0 = -16x^2 + 20x - 19.5$

$a = -16$ $b = 20$ $c = -19.5$

$x = \frac{-(20) \pm \sqrt{(20)^2 - 4(-16)(-19.5)}}{2(-16)}$

$x = \frac{-20 \pm \sqrt{-848}}{-32}$ → imaginary

never, the ball never reaches a height of 20 ft

f. How close or far away can the goal be that is 6ft tall for the ball to be able to score?

bad question

max height is 6.75 ft

$h = 6$

$6 = -16x^2 + 20x + 0.5$

$0 = -16x^2 + 20x - 5.5$

$a = -16$ $b = 20$ $c = -5.5$

$x = \frac{-(20) \pm \sqrt{(20)^2 - 4(-16)(-5.5)}}{2(-16)}$

$x = \frac{-20 \pm \sqrt{48}}{-32}$

$t = 0.84$ sec

$t = 0.408$ seconds away

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

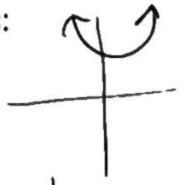
9. What will the parabola graph look like if…

$0 < t < 0.408$

$0.84 < t < 1.275$

a. The function has a Negative Discriminant is:

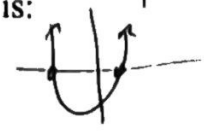
$b^2 - 4ac < 0$ $\sqrt{-11}$



no x intercepts

b. The function has a Positive Discriminant is:

$b^2 - 4ac > 0$ $\sqrt{+11}$



2 x intercepts

c. The function has a Discriminant of 0 is:

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

1 x intercepts

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

$(p-16)(p+2)=0$ (-32: -16, 2; -14)

$p-16=0 \quad p+2=0$

$p=16 \quad p=-2$

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

$7t^2+21t-4t-12=0$ (7·12 = -84; 21, -4; 17)

$7t(t+3)-4(t+3)=0$ Bottoms Up $(t-\frac{21}{7})(t-\frac{4}{7})$

$(t+3)(7t-4)=0$ $(t-3)(7t-4)$

$t+3=0 \quad 7t-4=0$

$t=-3 \quad t=4/7$

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

$3x(4x+3)=0$

$3x=0 \quad 4x+3=0$

$x=0 \quad x=-3/4$

14. $y^2 + y = 56$

$y^2+y-56=0$ (-56: 8, -7)

$(y+8)(y-7)=0$

$y+8=0 \quad y-7=0$

$y=-8 \quad y=7$

15. $49x^2 - 1 = 0$ Difference of squares

$(7x-1)(7x+1)=0$

$7x-1=0 \quad 7x+1=0$

$x=\frac{1}{7} \quad x=-\frac{1}{7}$

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

$27x^2-18x+3=0$ (9·3 = 27; -3, -3; -6)

Guess & check $3(9x^2-6x+1)=0$ Bottoms Up $3(x-\frac{3}{9})(x-\frac{3}{9})$

$3(3x-1)(3x-1)=0$ $3(x-\frac{1}{3})(x-\frac{1}{3})$

$3x-1=0 \quad 3x-1=0$ $3(3x-1)(3x-1)$

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

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

$5m^2-16p+15=0$ (5·15 = 75; -5, -15)

Not factorable

Quad Formula

$m=\frac{-(-16)\pm\sqrt{(-16)^2-4(5)(15)}}{2(5)}$ $m=\frac{16\pm\sqrt{-44}}{10}$ $m=\frac{16\pm 6.633i}{10}$

$m=1.6+0.6633i$

$m=1.6-0.6633i$

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

$63g(g^2+4)=0$ Sum of squares $(g+2i)(g-2i)=0$

$g=0 \quad g^2+4=0$

$g^2=-4$

$g=\pm\sqrt{-4}$ $g=2i \quad g=-2i$

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

$49x^2+42x+5=0$ $b^2-4ac=784$ (245: 35, 7; 42)

$(x+35)(x+7)$ Perfect square, so factorable

$(x+\frac{5}{7})(x+\frac{1}{7})$ $(7x+5)(7x+1)=0$

$x=-\frac{5}{7} \quad x=-\frac{1}{7}$

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

$2(4p^2-5p-9)$ (4·-9 = -36; 4, -9; -5)

$2(4p^2+4p-9p-9)$

$2(4p(p+1)-9(p+1))$

$2(p+1)(4p-9)=0$

$p=-1 \quad p=\frac{9}{4}$