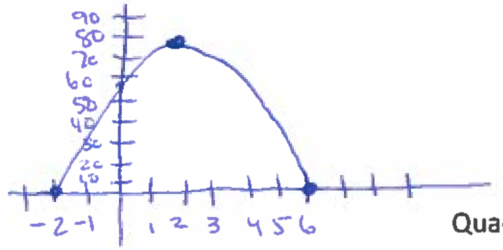

Name: KEY

Date: ______________

Period: ______________

Quadratics Unit Re-engagement Problems

sketch

1. The equation for the projectile's height *h(t)* at time *t* seconds after launch is $h(t) = -4.9t^2 + 19.6t + 58.8$, where height is in meters.

a. When does the object strike the ground? → Key words to indicate that we are looking for the solutions to the quadratic equation.

$h(t) = -4.9t + 19.6t + 58.8$

$h(t) = -4.9(t+2)(t-6)$

$t+2=0$ $\qquad$ $t-6=0$

$\cancel{t=-2}$ $\qquad$ $t=6$

a negative time is not reasonable

The object will strike the ground after exactly 6 seconds

b. What is the object's maximum height?

vertex (x, y) → key word to indicate that we are looking for a vertex.

$\frac{-b}{2a} = \frac{-19.6}{2(-4.9)} = 2$ → $-4.9(2)^2 + 19.6(2) + 58.8 = 78.4$

The maximum height will be 78.4m

c. When does the object reach its maximum height? → x-value (t) at the vertex

Because x is 2 when y is 78.4 at the vertex, 2 seconds have passed when the object is at its max. height.

d. From what height was the projectile launched?

The projectile was launched from 58.8 m. I know this because the y-intercept is 58.8m which means that the projectile was 58.8 m high at time zero.

2. Jack draws a rainbow which is a parabola that has the equation $y = -0.1(x - 1)^2 + 6$, where *x* and *y* are measured in centimeters.

a. How tall is the rainbow?

The equation is already in vertex form so I can identify that the vertex is (1, 6). Since 6 is the y-value of the vertex, it represents the highest point of the rainbow.

6 cm

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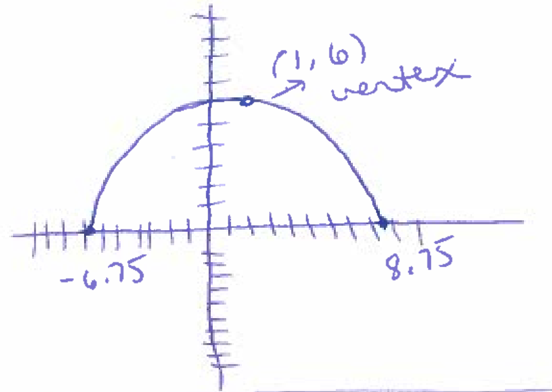
b. How far away are the end points of the rainbow from one another?



a sketch helps here:

The end points are located at the x-intercepts.

To find the solutions, I will expand into standard form and then use the quadratic formula.

$y = -.1(x-1)^2 + 6$

$= -.1(x-1)(x-1) + 6$

$= -.1[x^2 - 1x - 1x + 1] + 6$

$= -.1(x^2 - 2x + 1) + 6$

$= -.1x^2 + .2x + -.1 + 6 = -.1x^2 + .2x + 5.9$

$a = -.1 \quad b = .2 \quad c = 5.9$

$\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \dfrac{-.2 \pm \sqrt{(.2)^2 - 4\cdot(-.1)(5}}{2(-.1)}$

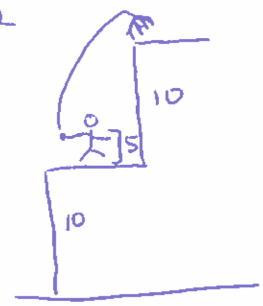
$= \dfrac{-.2 \pm \sqrt{2.}}{-.2}$

$-6.75 \quad 8.75$

The total distance b/w the two points is $\approx$ 15.5 cm

3. You and a friend are hiking in the mountains. You want to climb to a ledge that is 10 ft. above you. The height of the grappling hook you throw is given by the function $h(t) = (-8t + 15)(2t + 1)$.

a. What is the maximum height of the grappling hook? Can you throw it high enough to reach the ledge? → vertex



To find the vertex of the equation, expand the factored form into standard form:

$h(t) = (-8t + 15)(2t + 1)$

$= -16t^2 - 8t + 30t + 15$

$= -16t^2 + 22t + 15$

now use $\dfrac{-b}{2a}$ to find the x-value of the vertex: $\dfrac{-22}{2(-16)} = .6875$ and plug that into original equation to find the max. height

$-16(.6875)^2 + 22(.6875) + 15 = 22.56$. The vertex of the equation is 22.56 ft. However the y-intercept is 15 indicating that hook is thrown from a starting point of 15 ft so it is NOT high enough