Acc CCGPS Geometry Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Information:** You will demonstrate your knowledge of quadratic functions by solving & discussing problems involving projectile motion. Submit this page and 2 graph pages.

**Problem 1:** A gun is fired straight upwards. The bullet has a muzzle velocity of 2200mph, the formula you will use needs the velocity to be meters per second. Convert this now; round your answer to the nearest whole meter. You’ll use this over and over; make sure it’s right!

1 mile: 5280 feet

1meter : 3.28 feet  **V = \_\_\_\_\_\_\_\_\_\_\_m/sec**

In the formula below, h(t) = height in meters as a function of time, v = velocity (meters/second), t = time (in seconds). Plug the velocity , and a height of 0 into the formula, then solve to find t. This will give you two answers, one of which is the time it leaves the gun and the second is the time it hits the ground again. Change the time from seconds back to minutes.

h(t) = ½ (g)t2 + vt

The gravity coefficient for Earth is 9.8m/s2

h(t) = ½ (-9.8)t2 + vt

h(t) = -4.9t2 + vt

**t = \_\_\_\_\_\_\_\_\_\_\_sec**

**t = \_\_\_\_\_\_\_\_\_\_\_min**

**Problem 2:** Similar to Problem 1, but we’re going to do it on Mars then Jupiter! Same gun, so it will have the same initial velocity, but different planet, so gravity will be different. The gravity coefficient for Mars is only 3.7, and is 23.1 for Jupiter. To avoid the bullet coming back down on your head, how long do you have to get out of the way?

**On Mars?** **On Jupiter?**

**t = \_\_\_\_\_\_\_\_\_\_\_sec t = \_\_\_\_\_\_\_\_\_\_\_sec**

**t = \_\_\_\_\_\_\_\_\_\_\_min t = \_\_\_\_\_\_\_\_\_\_\_min**

**Problem 3:** Use graph paper graph to compare the parabolas. I want to see one of the following. Either Earth and Mars on the same graph, or Earth and Jupiter. You do not need to include all 3 curves; just pick 2!

On the graph, note the following for each curve: x intercepts, maximum, intervals of increase & decrease.

**Problem 4:** Using something a little slower and on Earth. A stone is launched from a catapult which is situated at the top of a tower 30meters above the ground. The initial velocity of the stone is 65 meters/sec. How many seconds will it take until the stone strikes the ground? Remember that the 1st step to solving a quadratic is to get a zero on one side.

Use this formula: h(t) = ½ gt2 + vt

**Problem 5:** Using graph paper, draw a graph of the situation. Label x and y intercepts, the vertex & the axis of symmetry. Answer the following questions.

How long did it take the stone to reach its maximum height?

What was the maximum height of the stone?

For what interval of time was the stone decending?

The domain of this function is limited to the times that rock is in the air. What is the domain?

The range is limited as well. What is the range?

Describe what the x and y intercepts represent.

**And now the boring part:**

Describe the following transformations from the parent quadratic function.

6.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12. Convert *f*(*x*) = *x*2 – 2*x* – 5 into vertex form and state the coordinates of the vertex.

13. Convert *f*(*x*) = 2(*x* + 1)2 + 5 into standard form. State the AOS equation.