Due: October 11th/12th

Name: _____

PAP Algebra II

Quadratic Equations Project:

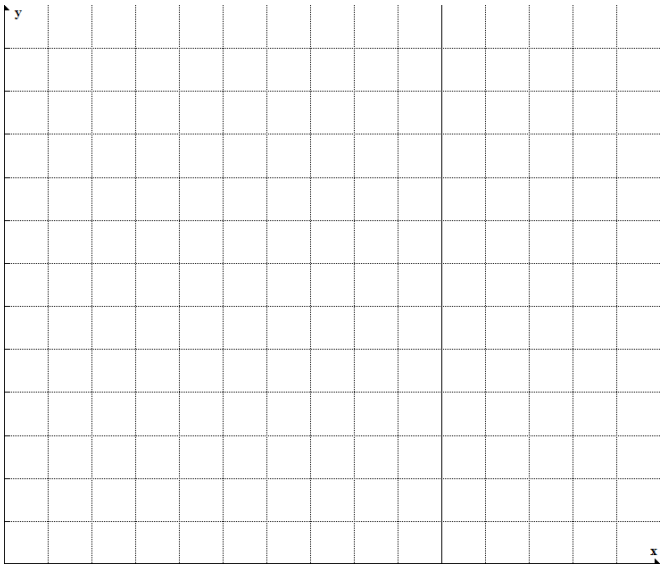
PART 1

Quadratic equations have important applications in science and engineering. For example, the parabolic path of a bouncing ball is described by a quadratic equation. In fact, the motion of all falling objects can be described by quadratic equations.

A basketball game is about to begin. The referee tosses the ball vertically into the air. A video camera follows the motion of the ball as it rises to its maximum height and then begins to fall. The following table gives the height of the ball in feet at every 0.1 seconds. After 1.1 seconds, one of the players makes contact with the ball and taps it to a teammate.

1. Graph the motion of the basketball.

Time (s)	Height of basketball (ft)
0.0	6.00
0.1	7.84
0.2	9.36
0.3	10.61
0.4	11.47
0.5	12.00
0.6	12.30
0.7	12.19
0.8	11.83
0.9	11.12
1.0	9.98
1.1	8.64



The height of a basketball thrown up in the air can be modeled by the following quadratic equation:

$$h = \frac{1}{2}gt^2 + v_0t + h_0$$

2. The variables in the equation:
   a. h → height of the basketball
   b. g → gravity
   c. v_o → initial velocity
   d. h_o → initial height
   e. t →time

On Earth, gravity (g) is always equal to -32 feet per second squared. It is negative because the force of gravity pushes downward.

A decent basketball player shoots a basketball with a speed or velocity (v_o) of about 20 feet per second.
Of course, the ball is not on the ground when it is thrown in the air. So, the starting height (h_o) is not equal to 0, but probably something like 6 feet, the height of a basketball player.

3. Plug in all these numbers for the appropriate variables and simplify the equation.

$$h = \frac{1}{2}gt^2 + v_0t + h_0$$

4. How can you tell this equation is quadratic (and therefore, a parabola)?
   _____
   _____
5. Does this parabola smile or frown? How can you tell? Why? _____
   _____
6. Using a graphing calculator, find the vertex: (,)
   What is the maximum height of the basketball? _____
   At what time does the basketball reach its maximum height? _____

7. If no one tapped the ball and it just fell to the ground, at what time will it hit the ground?

8. Take a look at your graph. At what point(s) in time is the basketball at a height of 10 feet above the ground? _____ seconds and _____ seconds

9. During what interval of time is the height of the basketball above 10 feet? Highlight this interval of time on your graph.

10. During what interval of time is the height of the basketball below 10 feet? Highlight this interval of time on your graph in a different color.