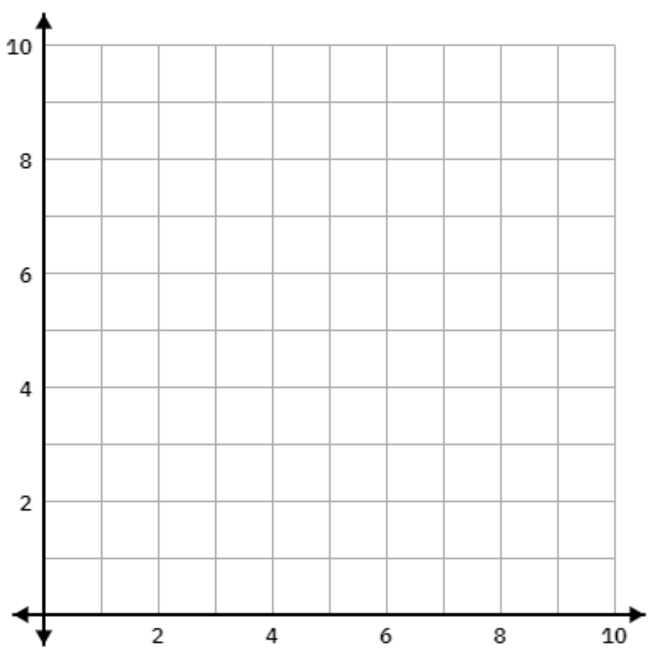
Name: **Date:** **Class:**

Calculus Worksheet: Bounce Test Documentation

Instructions: Choose **AT LEAST THREE** different surface and ball combinations. Bounce the ball from the same height each time, and record the bounce using a slow-motion camera or a motion detector.

Test #1
Surface:__________________ Ball:_________________________
Plot at least 5 points on the graph.

X	Y



1. General observations about the bounce:

2. Label the axis of the graph. What are your units for x and y?

3. Use quadratic regression on your calculator to get an equation that fits the points. Sketch the graph of the equation on the graph above.

   Equations:

4. Plot the velocity graph if the data can be obtained from motion detectors; otherwise, skip to Question 5.

5. Take the 1st derivative of your position equation. Plot this function as a velocity/time graph.

6. What do you notice?

7. What does the first derivative tell us?

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8. If you were to plot the acceleration, what do you think it might look like? Take a guess! (Think about the forces acting on the ball. How many are there?)

9. Take the second derivative of your position equation. Plot this function as an acceleration/time graph.

10. What does the second derivative tell you about the graph in motion problems?

11. What does the acceleration graph look like? Why does it look the way it does? Was your guess in Question 8 correct?

12. Would this surface/ball combination be a good fit for your game? Why or why not?

Repeat for the next 2 bounces