Names:

Lab – Position vs. Time with Acceleration
AP Physics 1

Objective: I can describe the motion of an object using mathematical and graphical representations by analyzing experimental data related to kinematic quantities.

In this lab, you will be utilizing a ramp (made using the air tracks in the lab and raised ledges) and a lab cart. ***Please do not move the ramp from its position.*** However, unlike in the first section of the course, the cart may not be moving with a constant velocity! Your goal is to determine the mathematical relationship between position of the cart and the time that the cart travels for by analyzing experimental data which you gather by sending the cart down the ramp. In the end, you should have a linearized graph which you can then analyze!

Materials
- Stopwatch (use your phone if needed)
- Meter stick
- Air track
- Lab cart
- Raised height
- Bumper

Procedure
1. Have one member of your group secure the lower end of the ramp – you don't want the ramp to fall when the car hits the bumper (watch your fingers)!
2. Hold the cart at rest from some point on the ramp, and measure the displacement between the starting point and the bumper (take down the ramp to be positive).
3. Start the timer as you release the cart.
4. Stop the timer when the cart hits the bumper.
5. Repeat steps 2-4 for multiple points.
6. Use your data from the table below to create a graph in Figure 1. Fit a power trendline to it.
7. If need be, create a linearized graph in Figure 2.

Data

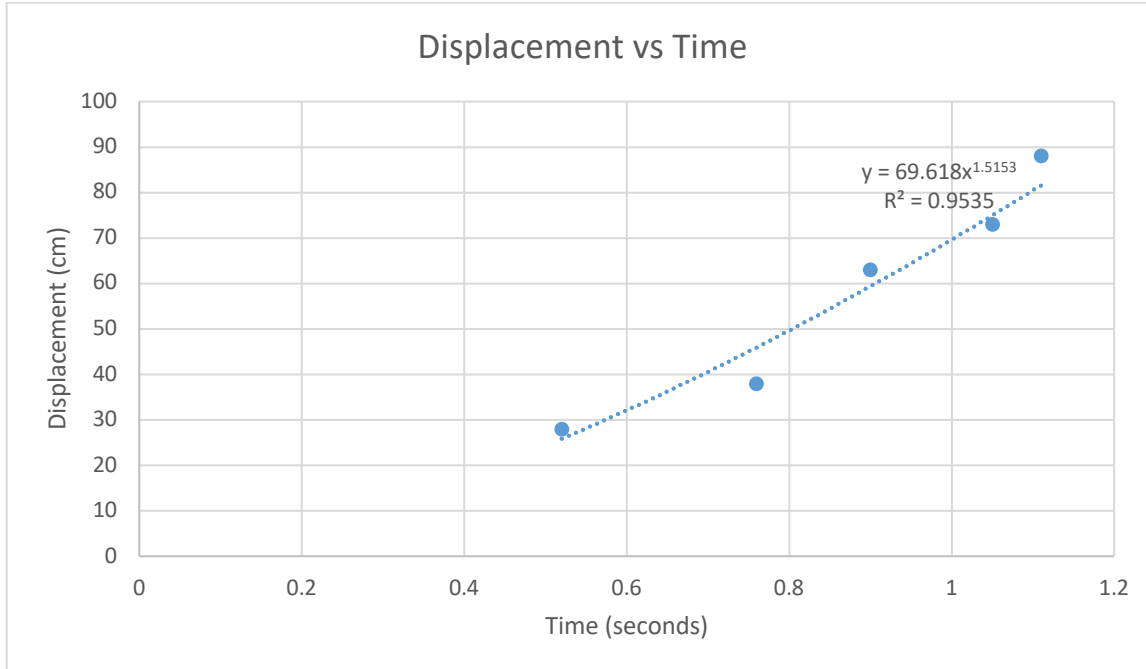| Time (s)	Displacement (cm)
0.9 s	63cm
1.11s	88cm
0.76s	38cm
0.52s	28cm
1.05 s	73cm

Results and Discussion

Names:

Figure 1. A graph representing the raw data taken from the laboratory.
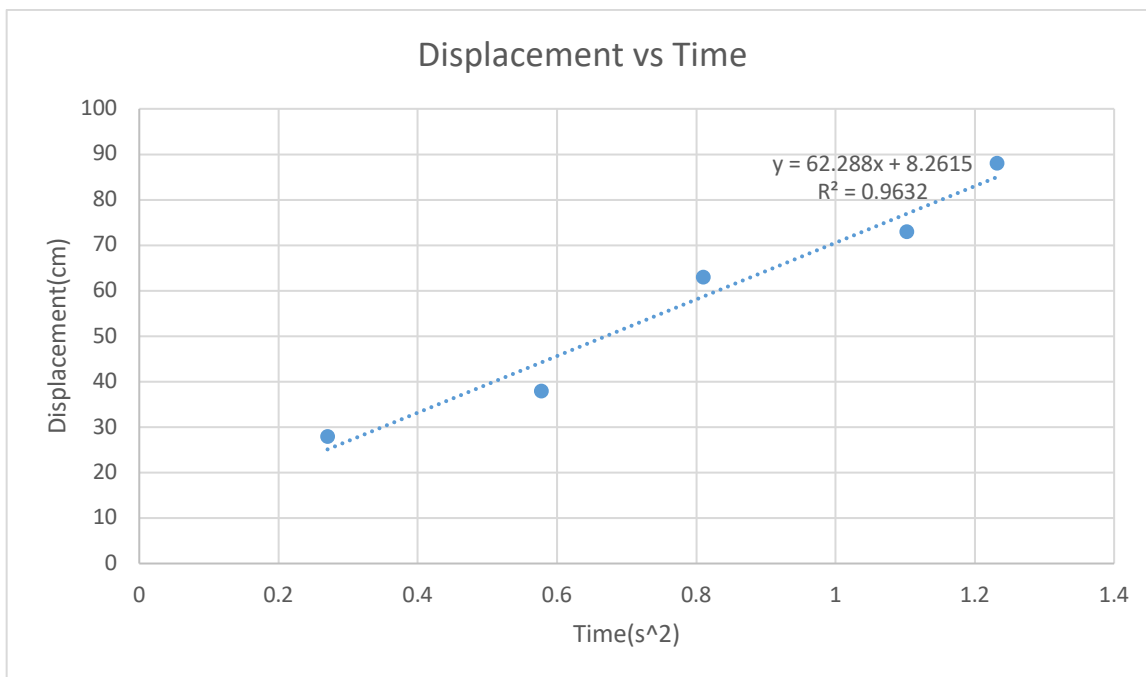

Figure 2. A linearized graph for the experiment.
1The slope of the linearized graph represents the acceleration of the cart, the units of the slope would be cm/s^2. Displacement is directly proportional to time squared.

Delete this text before you submit. Analyze your graphs and determine what the slope for the linearized graph might represent – what units would the slope have? How are displacement and time related to each other (what is the proportionality?)? Should the y-intercept be 0? Why is it not, if so?