Physics 12 projectile lab: hints for lab write-up

This document provides some advice on how to answer and explain the questions that ask, ***"Does the graph support projectile motion theory?"***

Those questions are:

Data Table #1 (horizontal component of motion)

- **Page 3, B (d):** Referring to the d_x vs t graph

Data Table #2 (vertical component of motion)

- **Page 5, A (c):** Referring to the d_y vs t graph
- **Page 5, B (b):** Referring to the v_y vs t graph

Projectile motion theory - the following are the key points:

- In your lab, assuming that friction is negligible, the only forces acting on the puck after you released it are the force of gravity (F_g) and the Normal force (F_N). Both those forces act in the vertical (y) direction. Therefore, net horizontal force = 0N ($\sum F_x = 0N$), and the net vertical force is constant and non-zero ($\sum F_y \neq 0N$).
- Newton's 2nd Law is applicable to both the horizontal component and the vertical component.
  - $\sum F_x = ma_x = 0N$, therefore $a_x = 0\ m/s^2$
  - $\sum F_y = ma_y \neq 0N$, therefore a_y = constant (non-zero)

For each of the 3 questions, discuss and explain the following 3 things (in a few sentences):

- State and explain the expected shape of the graph, and the theory supporting that expectation
  - ***There are 2 possible graph shapes in this lab:***
    - Linear (straight line)
    - Parabolic (a curve that is described by the quadratic equation: $0 = ax^2 + bx + c$)
  - ***Here's an example of how to use theory to predict graph shape: For the horizontal position (d_x) vs time (t) graph:*** *Since $\sum F_x = 0N$, we know that $a_x = 0\ m/s^2$. Therefore v_x is constant. Since v_x is constant, and the slope of the position vs time graph represents velocity, the slope of the d_x vs t graph should be constant. Therefore, the d_x vs t graph is expected to be a straight line.*

- State the actual shape of your graph

- State whether or not your graph shape is consistent with the expected shape (i.e. does it match the expected shape?).