Raid Ahmed Homework 4

Problem 3 (c):

The $\dot{x}$ and $\dot{y}$ plot shows the rate of change of position for the particle in the x and y directions. These values are the velocity of the particle. The x velocity stays constant for the most part, keeping in line with the linear progression for the x trajectory. The y velocity starts positive but decreases into the negatives. This is reflected in the trajectory as the y position increases exponentially, tops out, then decreases exponentially. This flip is due to the force of gravity on the particle.

The $\ddot{x}$ and $\ddot{y}$ plot shows the rate of change of velocity, or acceleration in both directions. Since no forces are applied in the x direction and $\dot{x}$ is not changing, its acceleration should be zero. The y acceleration should be a negative constant value, due to the force of gravity giving $\dot{y}$ a negative rate of change.

In the graph, the $\ddot{x}$ value oscillates around zero. The $\ddot{y}$ value oscillates around -.005, keeping in line with earlier assumptions.

Problem 3 (d):

When reporting the mean values of $\ddot{x}$ and $\ddot{y}$, we get

$\ddot{x} = 9.4026 * 10^{-6}$ $\ddot{y} = -.0052306$

These values are as expected. $\ddot{X}$ is very close to zero, and $\ddot{y}$ is a negative constant.

Problem 3(c):

By introducing noisy data, our graphs become much tougher to visually interpret. By taking the means of acceleration, we can see that $\ddot{x} = .00085086$ and $\ddot{y} = -.0040211$

$\ddot{y}$ is very close to the $\ddot{y}$ of $-.0052306$ without noise

$\ddot{x}$ is $.00085$, which is still close to zero but not to the same degree of $\ddot{x} = 9.4026 * 10^{-6}$.

This could mean that any $\ddot{x}$ acceleration is within the bounds for potential noise. Finally, despite the acceleration graph being impossible to visually interpret we can see from the velocity graph that $\dot{x}$ stays constant while $\dot{y}$ decreases.