Lunar Lander Lab Worksheet - AP **Name**_____

In this simulation, you will experience Newton's Laws from the standpoint of operating a spacecraft in a frictionless environment. You will learn how to pilot a lunar Lander, also called a Lunar Excursion Module or Lunar Module (LEM, LM) and land that craft on the surface of the moon. However, just like Neil Armstrong in 1969, you will have a limited amount of fuel and time before you will have to find a safe place to land the LM or suffer the consequences.

Procedure:

Familiarize yourself with the controls of the LM. Take a few minutes and play around with the Lander to see how it operates. If you can land your craft in between tighter boulders, you can get a higher score. Try flying horizontally and see what happens. Try boosting the LM at full thrust vertically upward and see what happens. Turn on the vector display so that you will visualize the factors acting on your Lander. ***Note that you can pause the program at any time to collect data!***

Newton's Laws:

Reset the simulation so that your LM has a full tank of fuel. Fire your engines for a short burst so that you gain some altitude. You should be at least 300m from the surface.

a. Record an initial altitude for the LM and let it fall toward the surface without firing its engine. Notice the y-Velocity on the display monitor. Use this information to calculate the acceleration due to the moon's gravity. Record your solution with the data you collected below.

b. Once you have calculated the moon's acceleration due to gravity, find the maximum acceleration of the LM due to its engines. Explain your solution below and show the data you used and collected.

c. Now with the data you collected and your answer to part (b), find the mass of the LM. Explain your solution below and show the data you used and collected.

d. Does your value for the mass of the LM change depending on how much fuel you use up in the simulation? Explain your reasoning.

e. According to your findings from this simulation, what would the LM's weight be on Earth? On the Moon?