Quantitative Problems
(Given, Find, Solution REQUIRED)

1. **A car reaches a max velocity of 4.31 [m/s] in 3.05 [s]. What was the average acceleration of the car if it started from rest?**

2. **A car can accelerate at an average rate of 4 [m/s^2]. How many seconds will it take the car to accelerate from 14 [m/s] to 68 [m/s]?**

3. **The MagicLewShip can accelerate at an average rate of 9.8 [m/s^2] (aka, the acceleration due to gravity).**
   a. **How may seconds would it take the MagicLewShip to reach the speed of light if it started from rest assuming at accelerated at this rate for the entire trip? The speed of light c = 3 x 10^8 [m/s].**
   b. **How many days is this?**

   Note: As far as we know, we CANNOT actually reach the speed of light. Einstein found that nature places an upper limit to the speed anything can attain. More on this later…

4. **A proton in the Linac 2 stage of the LHC can be accelerated from rest to 0.314c in 0.025 [s]. What is the average acceleration of the proton? Use c = 3 x 10^8 [m/s]. "c" is the speed of light as in "E=mc^2".**

Linac 2 Stage at CERN
Geneva, Switzerland

5. A baseball traveling at 90 mph (40.23 m/s) hits the catcher's mitt and comes to a stop in 0.015 [s]. What is the average acceleration of the baseball?

Qualitative Problems

Short answer (in a complete sentence) or a fully labeled graph
(Given, Find, Solution NOT required)

6. Draw an FBD of a ball dropped off of a building (assuming no air resistance).

7. Draw an FBD of a ball dropped off of a building (assuming some air resistance).

8. Sketch the "stacked" position vs. time, velocity vs. time, and acceleration vs. time graphs for a hockey puck that slides across an ice rink and slowly comes to rest due to friction. Include axes identifiers and units.

9. Sketch the "stacked" position vs. time, velocity vs. time, and acceleration vs. time graphs for a ball dropped off of a building (assuming no air resistance). Include axes identifiers and units.

10. Describe the progression of ideas/theories of acceleration of freely falling bodies from Aristotle, Galileo, and Newton.

1. 1.413 [m/s^2]

2. 13.5 [s]

3a. 30,612,245.9 [s]
3b. 354.3 [days]

4. 3.77×10^9 [m/s^2]

5. -2682 [m/s^2]

6-10. Will discuss in class