Physics 1210
Homework 2 Written-out Problems

1.
While containing the Northern Colorado/Southern Wyoming last Summer, helicopters supported ground crews by dropping water on the fires. At the time of release, the helicopters are flying in a horizontal path 90.0 m above the ground and with a speed of 64.0 m/s. Ignore air resistance and treat the water as a point object.

a) Compute how long the water is in the air
b) How far does the water travel horizontally before hitting the ground?
c) What is the final x velocity of the water just before it hits the ground?
d) What is the final y velocity of the water just before it hits the ground?
e) Use your computer software of choice to create and hand in plots of the y- position and velocity as a function of time and the x- position and velocity as a function of time.
f) From this information you have created, describe in plain language tips for fire fighting rookies both in the air and on the ground.

2.
You are an aerospace engineer at Virgin Oribit asked to test the specifications for the CubeSat launcher on the upcoming Flight 2 LauncherOne mission. (https://www.nasa.gov/content/about-cubesat-launch-initiative https://en.wikipedia.org/wiki/CubeSat ). Your CubeSat launcher is spring-launched and can therefore be tested with an equivalent test mass in a vacuum facility on Earth by shooting it vertically. Your test mass is 500 grams and leaves the launcher (at ground level) at 30 m/s straight up.

a) At what time should the test mass be moving at 15 m/s upward?
b) At what time should the test mass be moving at 15 m/s downward?
c) When does it return to ground level?
d) What is the acceleration of the test mass as it is moving upward? Downward?
e) Using your computer software of choice, create and hand in a plot of position versus time for the test mass with velocity and acceleration in the y- direction over-plotted at these times [t=0, t(+15m/s), t(h=max), t(-15m/s), t=tmax] . You are free to do any elements beyond the position versus time plotting by hand as necessary.
f) Given your calculations, can you now test to see if the CubeSat will be launched at 30 m/s