CS 4630/5630 Kresman Homework 3

**Problem 1** CS 4630 ONLY

Kinematics: With two stochiometric apps nearly behind you (in the 1st couple of weeks of the internship), your manager promised to cut you some slack! Managers meet once a month and discuss opportunities and success stories; the Kinematics team was short-staffed, and its manager asked your boss if you could help them build a kinematics app to study the behavior of projectiles in two dimensions assuming negligible air/frictional resistance. Your boss wanted to get your input; - while hesitant to step out of your comfort zone (and felt that the manager is not keeping the promise), you said yes anyway😊

The kinematics app may be console or GUI-based and accepts the user inputs: initial projectile velocity (meters/s); height (meters) above the ground the projectile is shot from; angle (degrees) of the projectile. Plot the graph of the projectile and other pertinent information.

**Problem 2** CS 5630 ONLY Do Problem 1 plus four similar computations—projectile angles 15 degrees, 30, 45, and 75—all in the same app! Plot all five graphs in the **same** 2-dimensional figure/axes.

**Resource/notes**:

* Use appropriate legend/colors in the plot so one can easily infer the projectile angle and other items of interest.
* (Pretty) print the following quantities
  + The two hard-coded equations and the four (derived) kinematics equations
  + Initial velocity, angle, and height above the ground; time to reach the maximum height, maximum height from the ground, and range
* Acceleration due to gravity, g, is 9.8 m/sec2. a = -g in the y direction
* Only two hard-coded projectile equations in the app: s(t) = integral (v(t) dt); v(t) = integral (a dt) [see Unit 13]
* Derive (**no** hardcoding) the four kinematics equations noted in class: two equations that express the (the x and y) velocity as a function of time, and two that express the (x and y) displacement as a function of time. As well, reflect the constant, as needed, in the sympy integration.
* Compute max height, time for max height & range) using sympy routines such as simplify, substitution, etc. (no hardcoding the formulae)

Use only the concepts we covered thus far. Canvas turn-in: lastnameHw4.ipynb & a word doc with run snapshots