Due March 17

EEE 208 – Programming for EEE
Homework #2

This problem is related to the trajectory motion, an example of kinematics in 2D. Following these steps helps you to understand how we formulate, solve, visualize and understand a real science/engineering problem using MATLAB.

At the top of the file, define these constants (use meaningful names)

i. Initial height of ball at release = 1.5 m

ii. Gravitational acceleration = 9.8 m/s^2

iii. Velocity of ball at release = 4 m/s

iv. Angle of the velocity vector at time of release = 45 degrees

Make a time vector that has 1000 linearly spaced values between 0 and 1.

If *x* is distance and *y* is height, the equations below describe their dependence on time and all the other parameters (initial height *h*, gravitational acceleration *g*, initial ball velocity *v*, angle of velocity vector in degrees θ). Solve for *x* and *y*

i. $x(t) = v * \cos(\theta \frac{\pi}{180})$ * t (We multiply θ by $\frac{\pi}{180}$ to convert degrees to radians).

ii. $y(t) = h + v \sin\left(\theta \frac{\pi}{180}\right) t - \frac{1}{2} g t^2$

Approximate when the ball hits the ground

i. Find the index when the height first becomes negative (use **find**).

ii. The distance at which the ball hits the ground is value of x at that index

Plot the ball's trajectory

i. Plot the ball's height on the y axis and the distance on the x axis (**plot**)

ii. Label the axes meaningfully and give the figure a title (use **xlabel**, **ylabel**, and **title**)

iii. Hold on to the figure (use **hold on**)

Run the script from the command window and verify that the ball indeed hits the ground around the distance you estimated. You should get a figure like this:

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```
>> throwBall
The ball hits the ground at a distance of 2.5821 meters
```