1. Start MATLAB by double clicking the icon on the desktop. Create a new script file by clicking the New Script button at the top left of the MATLAB window. An editor window will open. Enter the **launch.m** script file in this window. Save your script file by clicking the Save button at the top left side of the MATLAB window. A dialog window will open. Navigate to your USB drive drive (or desktop if you don’t have a USB drive) and name your M-File as **launch.m**.
2. Return to the MATLAB window. Click the button that has a folder with a green arrow. It is above the Current Folder sub-window. A dialog window will open. Navigate to your USB drive ( or desktop if you don’t have a USB drive). You should now see launch.m listed in the Current Directory window.
3. Click in the Command sub-window and type **launch** after the >>> prompt to run your script file. You will probably find that it doesn’t run the first time you try it because of syntax errors. These will appear as red text in the Command sub-window of the MATLAB window. Read the error and note the line number. Then go to this line in your script file from the editor window. Correct the error and run the script file again. Repeat this process until no more errors are displayed and a parabola appears in the Figure window.
4. Put MATLAB to the side for a moment and calculate where a projectile that is launched at 10 m/s at an angle of 45° should land in the absence of air resistance using your constant acceleration equations. Show your work here.



1. Run your script file. Enter 10 m/s for the launch speed and 45 for the launch angle. See where your projectile lands in the Figure window. If this doesn’t agree with what you calculated in step 4, then you’ll need to iteratively reduce **dt** in the script by a factor of 10 until they agree. You may need to zoom in on your graph. Your script file is now calibrated. Make sure that you save it.
2. Open up Logger Pro, insert the movie **PASCO107.mov** and digitize the trajectory. Place your coordinate system at the end of the launcher (centered on the white circle). Make sure your x-axis (the one with the yellow dot) is parallel to the table. Set the scale using the horizontal meter stick on the table.
3. Go back to your script file and enter the following values.
The mass of the styrofoam ball is in the video. Enter this as m (in kg) in your script file.
The drag coefficient is 0.5. Enter this as C in your script file.
The density of air is 1.2 kg/m3. Enter this as d (kg/m3) in your script file.
The diameter of the styrofoam ball is in the video. Use this to calculate the cross sectional area of (A = πr2). Show your work here. Enter this as A (m2) in your script file.
4. Transfer your digitized x data from Logger Pro into your script file using the following command.
xd = [#1 #2 #3 ... last#], where #1 is your first digitized x value. This command should appear before your plot command. You should be able to copy the column from Logger Pro and paste it into your script file.
5. Transfer your digitized y data from Logger Pro into your script file using the following command.
yd = [#1 #2 #3 ... last#], where #1 is your first digitized y value. This command should also appear before your plot command. You should be able to copy the column from Logger Pro and paste it into your script file.
6. Change your exiting plot command (plot(x,y)) to plot(x,y,xd,yd,’o’). This tells MATLAB to plot both your predicted trajectory (as a line) and your digitized trajectory (as a series of points).
7. Your goal now is to find the launch speed of the launcher. You will iteratively guess a launch speed, run your script and compare both trajectories. You will repeat this step until both trajectories overlap. Record your launch speed here.
8. Turn in this handout and e-mail your script file to richardt@muskingum.edu. Put your names in the subject line.