

Name: _____ Section: _____

Practice for Exam1.

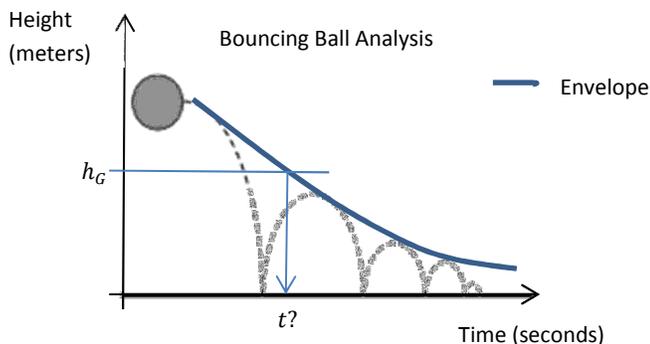
To optimize grading in the quickest turn-around time, please indicate if ≥ 90 is realistic: Possibly No Way

NO QUESTIONS WILL BE ANSWERED IF THEY PERTAIN TO WHY THE CODE DOES NOT WORK. NO QUESTIONS WILL BE ANSWERED REGARDING THE COVER SHEET EITHER. EVERYTHING IS WRITTEN HERE. **READ FULLY FIRST**. REFRAIN FROM RAISING YOUR HAND.

HOWEVER, PLEASE ASK FOR HELP IMMEDIATELY IF YOUR PC STARTS ACTING WEIRD!!!

SAVE OFTEN TO YOUR P:// DRIVE OR FLASHDRIVE!

A bouncing ball is dropped from an original height with a known velocity v_0 (m/s). The type of rubber the ball is made of is known, and therefore we know the bouncing coefficient k (no unit) of the ball. Determine graphically an approximate time (in seconds) after which the ball will never reach a given height (meters) again.



While the actual bouncing path (dashed) is difficult to plot (we will not plot it), the "envelope" (represented in a thick full line) is given by the function:

$$h(t) = \frac{9.81}{2} \left(\frac{1 - \sqrt{k}}{1 + \sqrt{k}} \right)^2 \left(t - \frac{2 * v_0}{9.81 * (1 - \sqrt{k})} \right)^2$$

Note that the envelope reaches $y=0$, then goes back up, though that part of the curve is useless and unrealistic. The ball does not start bouncing back up! Ignore that part of the curve.

At a given height h_G , a horizontal line will intersect with the envelope, giving a specific time (in seconds). This is an **approximate** time (in seconds) after which the ball will never reach that height again (meters).

Create a program that will plot the envelope **and** the horizontal line, so we can easily read the time at the intersection.

Step1 (5pts):

Step2: Shown above. Step3: Equation also given above.

Step4: Assume $v_0 = 10 \text{ m/s}$, $k = 0.4$, and $h_G = 4.6 \text{ m}$ (Test Case#1)

Step5/Step6: Solve graphically. NO MATH.

Step7a and 7b: place directly on the script file. There are no step 7c to show.

Requirements for the program itself:

(12pts) Hardcode a variable for each given.

(20pts) Define all vectors necessary to plot the envelope and the horizontal line (4 vectors)

(10pts) Plot correctly, using colors, markers and line specifications AS SHOWN in the videos.

(15pts) Title, label and legend the plot properly and fully

(7pts) – other random errors I should not even dream of!

(5pts) – Fill in the table

Test case	Initial velocity (v_0) m/s	Bouncing Coefficient (k)	Given height (h_G) meters	Approximated time (read on graph) 3 decimals.
#1	10	0.4	4.6	
#2	10	0.2	4.6	
#3	15	0.8	2.6	

Within script:

- name/section/purpose of code (**3pts**)
- commands to clean up previous execution of MATLAB codes (**3pts**)
- comments (which is considered the algorithm 7a) (**5pts**)
- spacing of code (**5pts**)
- appropriate variable names (no single letters) (**5pts**)
- semi-colon hiding intermediate calculations (**5pts**)