EGR 110 Due Date: In one week
Engineering Graphics
File: N110MA3

MATLAB Assignment #3

Reading Assignment:
MATLAB Lecture #3
MATLAB Handout

MATLAB Assignment:

1. (30 points) Write a MATLAB program to calculate the surface area and volume of a sphere as the radius varies from 0 to 3 inches in increments of 0.25 inches. The formulas are provided. Specific requirements include:
   a. Use vectors to store the values
   b. Print your name and the problem number (For example, Assignment 3, Problem 1) before printing the table.
   c. Print a table with three columns (for radius, surface area, and volume)
   d. Include a heading for each column, including units.
   e. Include plenty of comments in your program.
   f. Print out the program and the results of the program.

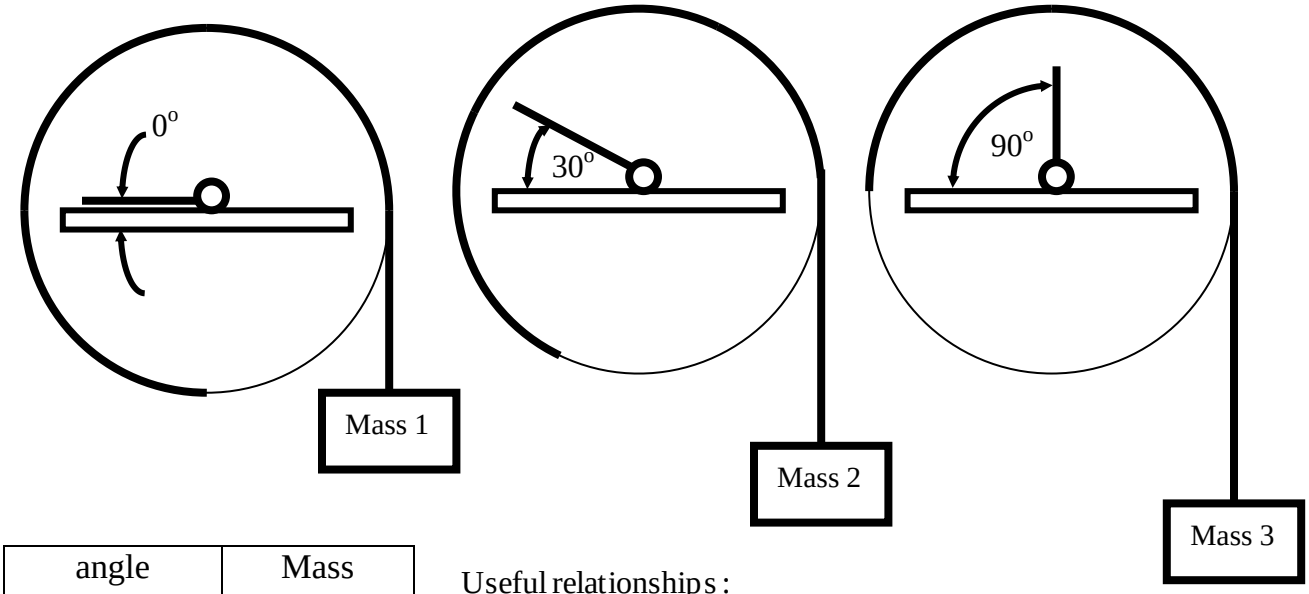
Formulas for a sphere of radius R:

$$\text{Surface Area} = 4 \cdot \pi \cdot R^2$$

$$\text{Volume} = \left(\frac{4}{3}\right) \cdot \pi \cdot R^3$$

2. (30 points) Write a MATLAB program to graph current, i(t), in amperes versus time, t in seconds, for the function $i(t) = 50e^{-2t}\sin(4\pi t)$ from t = 0 to 2.5 using about 100 points. Specific requirements include:
   a. Use vectors to store the values
   b. Include MATLAB commands in the program such that the graph will include:
      - A title, including your name (for example: i(t) versus t – John Doe)
      - Axis labels (include variable name, variable symbol, and units)
      - Gridlines
      - Linear scales
      - Blue stars for the points and a dashed line
   c. Include plenty of comments in your program.
   d. Print out the program and the graph (a color graph isn't necessary)

3. (40 points) If time allows, each team should perform an experiment to measure the torque generated by the mousetrap as the angle of the striking arm is varied. If there is not sufficient time for the experiment, use the data below.
   Experimental setup:
   In the setup shown below, a 6.0325 cm radius test wheel was attached to the mousetrap. As the mass attached to the test wheel was increased, the striking arm on the mousetrap would turn and the angle between the striking arm and the base of the mousetrap was measured..



angle A (degrees)	Mass m (g)
0	200
15	250
25	300
39	350
54	400
70	450
105	500
115	550
128	600
147	650
167	700

Useful relationships:

Weight = (mass)(acceleration due to gravity) or $W = mg$

where $g = 9.81\ m/s^2$

Torque = (Force)(distance) or for this experiment

Torque = (Weight)(radius of test wheel) = Wr

Example: If mass = 250 g, then

$W = mg = (250\ g)(9.81\ m/s^2) = (0.25\ kg)(9.81\ m/s^2)$

$W = 2.45\ N$

$T = Wr = (2.45\ N)(6.0325\ cm) = 14.79\ N \cdot cm$

Write a MATLAB program to calculate weight and torque for each of the data points provided and graph the results. Specific requirements include:

a. Use vectors to store the values for angle and mass provided.
b. Calculate the values for weight and torque (also using vectors).
c. Print a table with 4 columns for angle, mass, weight, and torque.
d. Print your name and the problem number before printing the table and also print headings for the table (including units).
e. Graph mass versus angle. Include MATLAB commands in the program such that the graph will include:
   - A title, including your name (for example: mass versus angle – John Doe)
   - Axis labels (include variable name, variable symbol, and units)
   - Gridlines
   - Linear scales
   - Include points (diamonds) and a solid black line.
f. Include plenty of comments in your program.
g. Print out the program, the output table, and the graphs.