3/6 In Class – Functions and Incline Plane

Today we learned how to write functions:

1. Write a function called `inchesToCM` that takes a number in inches and converts it to cm. Call the function from code or from the command window and show me the input and output.

2. Write a function `canSize` that computes the volume and surface area of a cylinder of radius, r and height, h. Call the function from code or from the command window and show me the input and output.

Now let's pick up where you were last time with the incline plane problems.

3. **The incline plane**: An object released from rest slides down a frictionless incline plane. Start with the plane at an angle of 30° wrt the horizontal.

   (a) Go to the board and draw a free body diagram for the object. Then start from Newton's Second Law and find the acceleration along the incline (or the unrotated components of acceleration.)

   (b) Is the acceleration constant? If it is, you can use the kinematic equations to find the position of the object as a function of time. (You pretty much derived them last time. Ask me if you don't remember.) So we all know what s is: I called s the position along the incline plane.

   (c) Write your structure plan

   (d) Back to the computers to code it.

   (e) On one page, plot s vs t.

   (f) On another page, plot unrotated (x is horizontal, not along incline) x vs t and y vs t.

   (g) As a check, on a third page, plot y vs x. Do you get what you expect?

   (h) Play with the angle of the incline as another check. What happens if you use $\theta = 90°$? Is that what you expect?

   (i) What happens if you use $\theta = 0°$? Is it what you expect?

   (j) Put θ back to some angle other than 0 or 90°.

   (k) Show me the final plots. Make them look nice, and print them. Put your name on them and turn them in.

4. Animate the plot of y vs x from the last problem. Is it what you expect? You may need to play with the pause values to see the effect. Or make the incline really long. Show me.

5. **For homework:** The incline plane with friction! Use $\theta = 30°$, $\mu = 0.2$, and $m = 1$kg as starting values. But play with them. Your program should make the plots listed below on two separate pages:

   Figure 1: s vs t with and without friction on the same graph (set of axes). (You should have the code to calculate s without friction from the last two problems.) s is the distance traveled along the incline.

Figure 2: The animated plot of y vs x for the case with friction. (This is physics, so it would be nice if it looks like it slides down the incline in the animation. This may affect your choice of signs for parts of the code.)

Please name the file `incline_YourName.m`