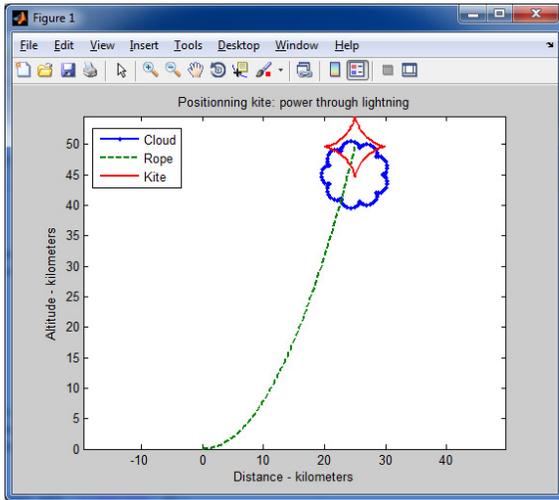Sp16. Exam1. Only 1 version made. PLEASE DO NOT SHARE WITH THOSE TAKING IT AT 1PM. THERE IS NO CURVING GRADES

Environmental & Energy Engineering
You have patented the secret to capturing lightning to transform it into energy, and can't wait to make lots of $$$$$$!
The cloud will deliver the lightning. For the process to work, the center of the kite (i.e. end of the rope) has to be positioned IN the cloud.

There are three plots in this figure: the cloud, the rope, and the kite itself. For simplicity, define the cloud **first**, then the rope, and the kite.

The cloud is defined by its size (k_{cloud}) and center position $x_{cloud_{center}}$ and $y_{cloud_{center}}$ which are known scalars that must be able to change easily in your code.
To plot the cloud itself (y $vs. x$), the parametric equations are:

$$x(\beta) = k_{cloud} * (10 * \cos(\beta) - \cos(10 * \beta)) + x_{cloud_{center}}$$
$$y(\beta) = k_{cloud} * (10 * \sin(\beta) - \sin(10 * \beta)) + y_{cloud_{center}}$$

Where β are a lot of angles going from 0 to 360degrees (or 0 to 2π if you prefer).

The rope (y $vs. x$) is a simple polynomial equation dependent on a x and the parameter k_{rope} (also a scalar whose value should be able to change easily).

$$y(x) = \left(\frac{x}{k_{rope}}\right)^2$$

Where x is a vector with a lot of values going from 0 to the $x_{cloud_{center}}$ (the center of the cloud variable you defined earlier).

The kite (y $vs. x$) is again a parametric equation, though you can re-use the same β as defined above!

$$x(\beta) = 5 * \cos^3(\beta) + x_{cloud_{center}}$$

$$y(\beta) = 5 * \sin^3(\beta) + \left(\frac{x_{cloud_{center}}}{k_{rope}}\right)^2$$

Plot the cloud, the rope and the kite on the same figure, and format as shown above. The last two words of the `legend()` command should be `,'location', 'best');` so that the legend pops up in the best location according to MATLAB.
Re-use your program to determine the setting to set up the kite in the cloud (remember: the kite is in the cloud if its center (i.e. end of the rope) is in the cloud). Zoom in if necessary!

k_{cloud}	$x_{cloud_{center}}$	$y_{cloud_{center}}$	k_{rope}	Is the kite in the cloud? YES/NO
0.5	25	45	3.55	
0.5	25		5.8	YES
0.2	10	50		YES

Complete Step1: (4pts)

Step2: plot already done. See front of cover sheet.

Step3: ALL equations in front of the cover sheet. No need for additional ones.

Step4: no assumptions can be made to simplify the problem.

Step5/Step6: mmm.. good luck doing this analytically. NOT TODAY!

Step7: ALL of step7 is done in the code as usual. The algorithm should be your comments as usual.

There is no output in this code. Suppress the output of absolutely all lines. NO proof of testing possible!

Format the plot fully as shown in the figure in the front page. Make sure to use different line types to differentiate each plot.

Rubric (100pts):

Step1 filled in	4pts
Table completed	2pts

In script:

Name, section, description	3pts
All clean up commands	3pts
Spacing of code – skip lines	5pts
No indenting of any kind	5pts
Comments/algorithm	7pts
Good variables names	5pts
Variables hardcoded/easy to change	5pts
Vectors to plot the cloud	5+5+5pts
Vectors to plot the rope	5+5pts
Vectors to plot the kite	5+5pts
Correct use of element per element operator	5pts
No extra/useless parentheses	5pts
Proper use of semi-colons	5pts
Proper plot command/setup	5pts
All plot formatting	6pts

5pts penalty if code crashes.

Bonus:

Name 3 operating systems and 4 applications?