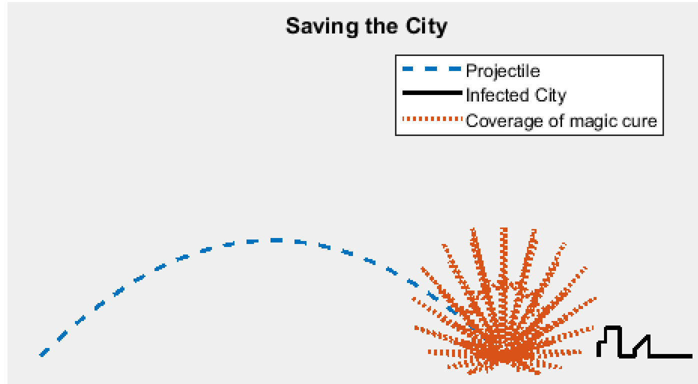
Name: ___________________________ SECTION: _____

Submit the .m file at the end of the time allocated, on canvas under link for Exam1.

RETURN COVER SHEET BEFORE LEAVING.

*If you don't like the story, make up your own but do the work expected regardless. ☺

A city has been infected by a deadly virus. You have the magic cure but it must be sent there with a projectile! You can control the initial angle ($\theta_i\ degrees$) and velocity ($V_i\ m/s$) of the projectile, as well as the coordinates of the city, and the settings (k_1 and k_2) of the magic cure so that the city gets mostly saved! Find all the settings so the city is saved!



(5pts) Engineering Process - **Step1**:

**Except for the city's coordinates, note that all these values should be able to be changed easily in the code.*

Step2: see screenshot above.

Step3: To plot the projectile, plot y vs. x with the following data:

x is a range of distances (meters) set from 0 to $V_i^2 * \dfrac{\sin(2*\theta_i)}{9.81}$.

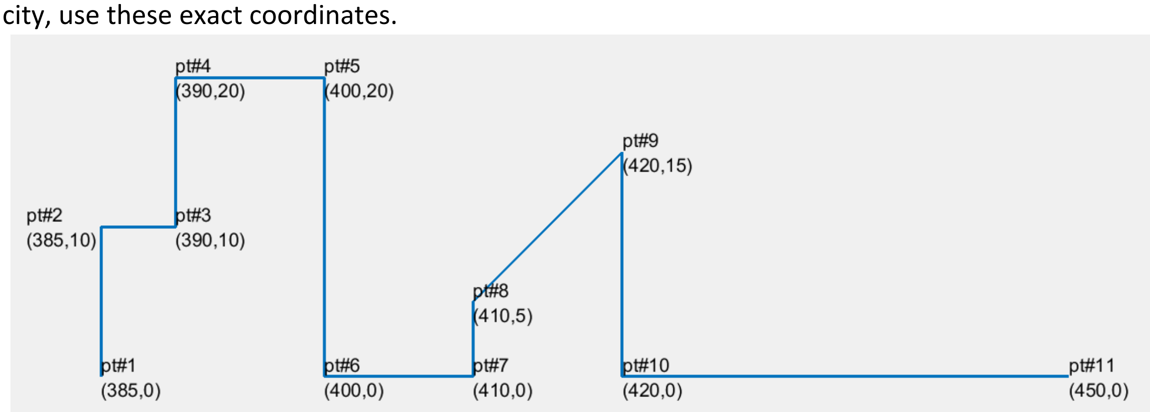
$$y_{height}(x) = \frac{-4.9}{V_i^2 * \cos(\theta_i)^2}\ x^2 + x * \tan(\theta_i)$$

To plot the coverage of the magic cure, plot y vs. x with the following parametric equations: β being angles set from 0 to 4π radians using k_2 number of data-points.

$$x(\beta) = k_1 * \left(\sin(\beta) + \sin\left(\frac{k_1\beta}{2}\right)^3\right) * \cos(\beta) + V_i^2 * \frac{\sin(2*\theta_i)}{9.81}$$

$$y(\beta) = k_1 * \left(\sin(\beta) + \sin\left(\frac{k_1\beta}{2}\right)^3\right) * \sin(\beta)$$

To plot the city, use these exact coordinates.



Step4: no assumptions would simplify any of these equations!

Step5 and 6: not applicable.

Steps7a and **b** must be in the script, as done in class (filename up to you). **Step 7c)** is not applicable here as the result is visual. The figure of your code must overall match the figure shown: use line types and colors of your choice. To place the legend in the best location, the fourth argument must be the string `'location'`, and the fifth argument must be the string `'best'`.

Test/Fill in the table below by re-using your code:
Note: Kind of a fun parametric equation, the magic cure changes DRASTICALLY depending on the settings- just plug/guess away!

V_i (m/s)	θ_i (degrees)	k_1	k_2	Is city saved?
56	45	50	100	no
		50	100	yes
80	40		150	yes

Overall heads up: some data is in radians, other in degrees. Be careful.
Please use the rubric below as a check list before submitting.

Extra Credit 1
In comments at bottom of your script, show the 3 lines of code to plot and answer this ("Find the limit as x goes to negative 2"):

$$\lim_{x \to -2} \frac{\frac{1}{x} + \frac{1}{2}}{x^3 + 8}$$

Extra Credit 2
Curiosity is the little robot on Mars. How many lines of code does it takes to run the 'thing'? (Estimate)

Complete intro	4pts	
Proper clean-up commands	2pts each	
Comments	5pts	
Proper and Consistent Spacing	5pts	
Proper variable names	5pts	
Semi-colons	5pts	
Does code run?	5pts	(I want a code that runs. Comment out what does not!)
Define data for projectile	5pts	
Equations for projectile	15pts	
Define data for city	5pts	
Define data for magic cure	5pts	
Equations for magic cure	15pts	
Proper use of element-per-element	5pts	
Plotting city	5pts	
Plotting magic cure	5pts	
Plotting projectile	5pts	
Line types	5pts	
Title	2pts	
Proper axis command	4pts	
Proper legend, with correct location	6pts	
Table filled in	5pts	
Leeway in grading	8pts	