Name: _____<mark>ANSWER</mark>_____ **SECTION:** _____
Submit the .m file at the end of the time allocated, on canvas under link for Practice Exam1.

*If you don't like the story, make up your own but do the work expected regardless. ☺
A circular target of known radius (R) is in sight, at a known x_{center} and y_{center} location. Though it has functioning issues, your laser gun has 2 known settings $(k_1\ and\ k_2)$. Determine what laser settings to use to still make it through the target!

Broke laser still hits target!

(5pts) Engineering Process - **Step1:**
Note that all these values should be able to be changed easily in the code.
<mark>Givens/Need: R, xcenter and ycenter</mark>
<mark>Find: k1 and k2</mark>
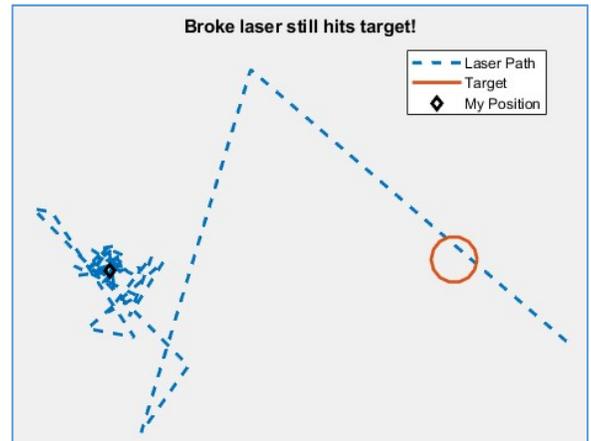
Step2: not applicable.
Step3: To plot the target, plot y vs. x with the following parametric equations: θ being angles set from 0 to 360°.
$$x(\theta) = R * \cos(\theta) + x_{center}$$
$$y(\theta) = R * \sin(\theta) + y_{center}$$
To plot the laser, plot y vs. x with the following parametric equations: β being angles set from 0 to 80 radians, with 55 data-points. *feel free to separate these equations in pieces if more comfortable!

$$x(\beta) = k_1 * \sin\left(\frac{\pi}{k_2}\beta^2\right) * \left(\frac{1}{\pi\beta} - \frac{3}{\pi^3\beta^5}\right)$$
$$y(\beta) = k_1 * \cos\left(\frac{\pi}{k_2}\beta^2\right) * \left(\frac{1}{\pi\beta} - \frac{3}{\pi^3\beta^5}\right)$$

<mark>A LOT OF YOU CAN'T PUT PARENTHESES IN THE RIGHT PLACES. IN THAT CASE, JUST SPLIT IT IN MULTIPLE PIECES.</mark>
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. Your location at (0,0) is simply done using the diamond marker but <u>must</u> be the last to plot to show up above the laser. 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'`. Assume the axis to be set to equal.

Test/Fill in the table below by re-using your code: (No units on these)

x_{center}	y_{center}	$Radius$	k_1	k_2	
300	10	20	2000	4	
-30	-10	2	200	<mark>-3.5</mark>	(hints: a negative, with 1 decimal)

Overall heads up: some data is in radians, other in degrees. Be careful.
The rubric and extra credit is on the back page. Use it as a check list before submitting.

Extra Credit 1

No need to show me the code:

$$\lim_{x \to 3} \frac{x^2 - 9}{x - 3}.$$

Determine: **BY PLOTTING, YOU GET 6. IF YOU KNOW 241, YOU CAN FACTOR AND GET RID OF (X-3) IN WHICH CASE YOU ARE LEFT WITH (X+3) AT THE NUMERATOR, THEN PLUG X=3!**

Extra Credit 2

Estimate how many years MATLAB took to be coded and first come out. 14YEARS

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 target	5pts	
Equations for target	15pts	
Define data for laser	5pts	
Equations for laser	15pts	
Proper use of element-per-element	5pts	
Plotting my position	5pts	
Plotting target	5pts	
Plotting laser	5pts	
Line types	5pts	
Title	2pts	
Proper axis command	4pts	
Proper legend, with correct location	6pts	
Table filled in	5pts	
Leeway in grading	8pts	

```matlab
%laser that shoots random
%by Caroline Liron
%some section. practice exam1. fall 2017.

clc;
clear;
close all;
%format commands useless as no output expected. leaving is ok.

%define laser data
k1 = 2000;
k2 = 4;
ts = linspace(0,80,55);
xs = k1 * sin(pi*ts.^2/k2) .* (1./(pi*ts) - 3./(pi^3*ts.^5));   % JUST 5 DOTS
ys = k1 * cos(pi*ts.^2/k2) .* (1./(pi*ts) - 3./(pi^3*ts.^5));

%if not confident in (), then split!
% part1 = pi/k2 * ts.^2;
% part2 = 1./(pi*ts);
% part3 = 3./(pi^3*ts.^5);
% part4 = part2-part3;
% xs = k1 * sin(part1) .* part4;
% ys = k1 * cos(part1) .* part4;

%define bowl to shoot at
radius=20;
xCenter = 300;
yCenter = 10;
thetas = linspace(0,360,15); %degrees
xTarget = radius*cosd(thetas)+xCenter;   %**NO DOTS ANYWHERE
yTarget = radius*sind(thetas)+yCenter;

%plot laser path and target, format appropriately
plot(xs,ys,'--',xTarget,yTarget,0,0,'kd','linewidth',2);

%or,
% plot(xs,ys,'--');
% hold on; %ONLY ONCE
% plot(xTarget,yTarget);
% plot(0,0,'kd','linewidth',2);

%format all properly
axis equal off;
title('Broke laser still hits target!');
legend('Laser Path','Target','My Position','location','best');

%no output.
```