Name: ANSWER section: ____

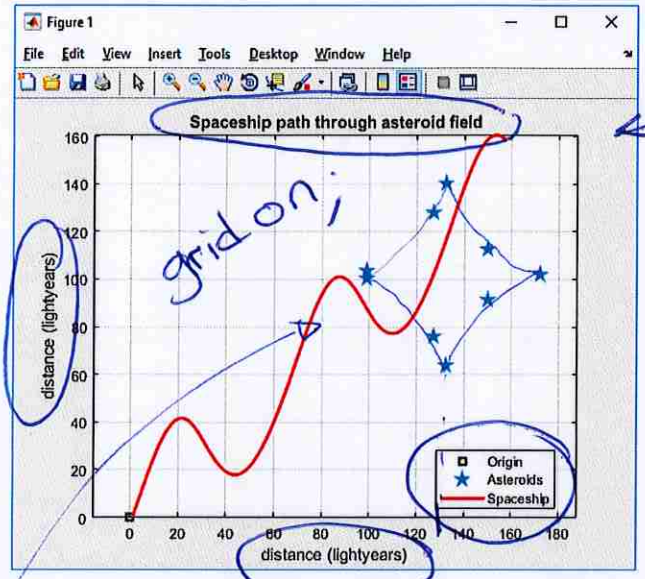
Practice Exam1 – Variables, vectors, plotting

Travel through asteroids! (About 33lines total. NO 7c.)

READ full directions please. Don't jump into code unless you know the end point!

Do as much as you can: do what you know first! COMMENT out anything that crashes but leave it! The basic rubric (and therefore points) can be done without actual code – do algorithm first – 10pts!

Also, to be clear: YOU MISS THE SUBMISSION LINK (55minutes after the hour), YOU GET A ZERO. – NO EXCEPTIONS.



You are to guide a spaceship **trough** an asteroid field. It must avoid the asteroids. Filename up to you.

Your graph should show all the data shown on the figure. Make sure to use different line styles for each plot. Different colors are optional. Nothing shows in the command window today.

1) The origin is at (0,0).

2) The asteroids (y vs. x) are plotted using the following parametric equation:

$$x(\theta) = R\cos^3(\theta) + x_0$$
$$y(\theta) = R\sin^3(\theta) + 102$$

where the parameter θ goes from 0 to 2π. **The number of data points in this vector of θ actually determines the number of asteroids! – this number of data points is a given that should be able to change easily**. When plotting this one, only use markers (no line). The other three givens (R, and x_0) should also be able to be modified easily.

3) The path for the spaceship (y vs. x) is also defined by another parametric equation with 2 other givens that should be able to change easily:

$$x(t) = 5 * \left(\cos(45+\beta) * \left(t + k_1 * \sin\left(\frac{t}{2}\right)\right) + \sin(45+\beta) * \left(t + \frac{1}{k_1} * \cos\left(\frac{t}{2}\right)\right) \right)$$

$$y(t) = 5 * \left(\sin(45+\beta) * \left(t + k_1 * \sin\left(\frac{t}{2}\right)\right) - \cos(45+\beta) * \left(t + \frac{1}{k_1} * \cos\left(\frac{t}{2}\right)\right) \right)$$

Where the parameter t goes from 0 to 30 (the unit is degrees). 0:30 ok

The other 2 givens (β *in degrees*, k_1 *unitless*) are scalars. **Modify those givens (by trial and error) to avoid the asteroid while you travel through the asteroid field!**

Use test1 below as your starting point. When that works, reuse your code and fill in the table so the spaceship travels through the asteroid field while avoiding the asteroids!

	Number of asteroids	R	β	k_1	x_0
Test1	10	40	42	5	125
Test2	20	20	(same as above)		125
Test3	42	50	44	2	100

up to you

*Do not zoom in anything. If the path line touches an asteroid, it is not avoided.

```
%asteroid travel
%by caroline Liron, spring2018, section xxx

clc;
clear;
close all;
%format compact; %maybe

%asteroid data
nPts = 20;
t = linspace(0,2*pi,nPts);% colon not applicable to change amt of data points EASILY
radius  = 20;
x0 = 125;
xsAsteroids = radius*cos(t).^3 + x0;
ysAsteroids = radius*sin(t).^3 + 102;

%spaceship travel
ts = 0:0.5:30; %or linspace(0,30) %number of data points not *much* of an influence
beta = 42; %rotation angle
k1  = 5;
part1 = ts+k1*sin(ts/2);
part2 = ts+1/k1*cos(ts/2);
xs2 =  5*( cosd(45+beta)*part1  +  sind(45+beta)*part2 );
ys2 =  5*( sind(45+beta)*part1  -  cosd(45+beta)*part2 );

%plot and format each line styles
plot(0,0,'sk',xsAsteroids,ysAsteroids,'p',xs2,ys2,'r','linewidth',2);
legend('Origin','Asteroids','Spaceship','location','best');
title('Spaceship path through asteroid field');
xlabel('distance (lightyears)');
ylabel('distance (lightyears)');
axis equal;
grid on;

%the hold on; method is totally acceptable. I have the preference above as
%it is less LOC and I don't have to retype linewidth a billion time. but
%you do what you want. as long as I only see ONE hold on; command, you're
%ok.
```

Basic rubric:

Like pilots, this is your checklist. Remember – no credit for using what has not been taught. Show me the basic.

- ☐ 10pts The code you submit MUST RUN. NO CRASH. What does not run must be commented out (not deleted).

- ☐ 3pts valid filename
- ☐ 3pts your name, section, a description,
- ☐ 3pts appropriate clean up commands,
- ☐ 5pts an algorithm as comments (comments throughout the code),
- ☐ 5pts proper and valid variable names (test with the `which` command),
- ☐ 5pts semi-colon **every line,**
- ☐ 5pts proper and consistent spacing,
- ☐ 5pts no indent at this time, and
- ☐ 5pts correct results

- ☐ 5pts givens for asteroids can change easily
- ☐ 15pts data points x/y for the asteroids
- ☐ 10pts givens for spaceship path can change easily
- ☐ 20pts data points x/y for spaceship path
- ☐ 5pts proper/minimum use of element per element operators
- ☐ 5pts proper/minimum use of parentheses
- ☐ 10pts combined plots
- ☐ 10pts line types and markers
- ☐ 19pts all formatting on the figure
- ☐ 4pts table filled in
- ☐ 8pts leeway – anything you do that is wrong and was not expected.

(160pts)