Phys234, 2018, Problem set #5: In-lab questions, Thursday lab

Question 1:

Find the two roots of the following non-linear system of equations:

$$y = x\ \cos(x) + \frac{1}{2}x^2$$
$$y = -x^2 + 12$$

You have to use the `newtonSys.m` function that I showed in class, so do not forget to hand in your user defined m-file that contains the evaluation of the Jacobian and the functions. Submit your solution as function m-file called `ps5q1.m`. This function should be organized as in the example below. In the building of your answer you may want to print various results and use different initial conditions. But for the final file you submit, make sure that it only prints out the answer for your two roots.

```
function ps5q1
% ID: xxxxxxx, name
% Solution to question 1, problem set 5
%

... % initialization, etc.

% Get 1st root
x_root1 = ...  % your operations to get root (2-element column vector)

% Get 2nd root
x_root2 = ...  % your operations to get root (2-element column vector)

% print out of the answer
fprintf('The first root is \n')
fprintf('x = %15.12f\n', x_root1(1) )
fprintf('y = %15.12f\n\n', x_root1(2) )
fprintf('The second root is \n')
fprintf('x = %15.12f\n', x_root2(1) )
fprintf('y = %15.12f\n\n', x_root2(2) )


end
```

Question 4:

Here is a set of observed data (x_i, y_i), i=1 to 6,

i	1	2	3	4	5	6
x	1.14	5.62	0.31	2.21	3.54	2.87
y	3.40	66.2	0.43	8.95	32.8	19.4

These data can be fit with the following quadratic equation, $y = ax^2 + bx + c$. Write a function `ps5q4` that finds the coefficients a, b and c that best fits these data in the least squares sense. You are not allowed to use the built-in `polyfit` function.