Homework for Week 2

Create a script file and include all of the following problems with each one being on section. Use the MATLAB publish feature to publish script to a word or pdf file.

Problem 1 Consider the array A, Compute the array B by computing the square roots of all the elements of A whose value is no less than 0 and adding 50 to each element that is negative

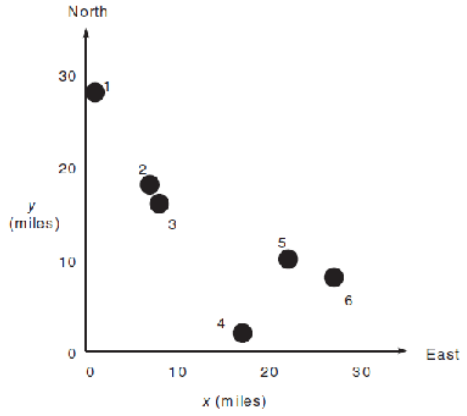
$$A= \begin{bmatrix} 0 & -1 & 4 \\ 9 & -14 & 25 \\ -34 & 49 & 64 \end{bmatrix}$$

Problem 2 Determine how long it will take to accumulate at least $10,000 in a bank account if you deposit $500 initially and $500 at the end of each year, if the account pays 5 percent annual interest

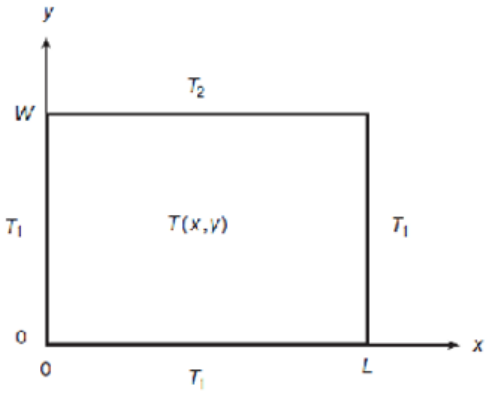
Problem 3 The price, in dollars, of a certain stock over a 10-day period is given in the following array.
Price=[19,18,22,21,25,19,17,21, 27, 29]
Suppose you owned 1000 shares at the start of the 10-day period, and you bought 100 shares every day the price was below $20 and sold 100 shares every day the price was above $25. Write a script to compute (a) the amount you spent in buying shares, (b) the amount you received from the sale of shares, (c) the total number of shares you own after the 10th day, and (d) the net increase in the worth of your portfolio.

Problem 4 A company wants to locate a distribution center that will serve six of its major customers in a 30x30 mi area. The locations of the customers relative to the southwest corner of the area are given in the following table in terms of (x, y) coordinates (the x direction is east; the y direction is north). Also given is the volume in tons per week that must be delivered from the distribution center to each customer. Then weekly delivery cost c_i for customer i depends on the volume V_i and the distance d_i from the distribution center. For simplicity we will assume that this distance is the straight-line distance. (This assumes that the road network is dense.) The weekly cost is given by $ci = 0.5d_iV_i$, $i = 1, \ldots, 6$, Find the location of the distribution center (to the nearest mile) that minimizes the total weekly cost to service all six customers.

Customer	x location (mi)	y location (mi)	Volume (tons/week)
1	1	28	3
2	7	18	7
3	8	16	4
4	17	2	5
5	22	10	2
6	27	8	6



Problem 5 Many applications require us to know the temperature distribution in an object. For example, this information is important for controlling the material properties, such as hardness, when cooling an object formed from molten metal. In a heat-transfer course, the following description of the temperature distribution in a rectangular metal plate is often derived.



The temperature is held constant at T_1 on three sides and at T_2 on the fourth side. The temperature as a function of the *xy* coordinates shown is given by

$$T(x,y) = (T_2 - T_1)w(x,y) + T_1$$

where

$$w(x,y) = \frac{2}{\pi}\sum_{n\ odd}^{\infty}\frac{2}{n}\sin\left(\frac{n\pi x}{L}\right)\frac{\sinh(n\pi y/L)}{\sinh(n\pi W/L}$$

Use the following data: $T_1 = 70°F$, $T_2 = 200°F$, and W=L=2ft.

a. The terms in the preceding series become smaller in magnitude as *n* increases. Write a program to verify this fact for n=1, …., 19 for the center of the plate (x=y=1)

b. Using x=y=1 , write a program to determine how many terms are required in the series to produce a temperature calculation that is accurate to within 1 percent. (That is, for what value of *n* will the addition of the next term in the series produce a change in *T* of less than 1 percent?) Use your physical insight to determine whether this answer gives the correct temperature at the center of the plate.

c. Modify the program from part b to compute the temperatures in the plate; use a spacing of 0.2 for both x and y.

Problem 6 On January 1st, Cindy opens a savings account and deposits $10,000. At the end of every month, she deposits $1000 more into the account for the next 12 months (starting January 31). At the end of each month (before the $1000 deposit), interest is calculated and added to her balance. The monthly interest rate varies depending on the account balance at the time interest is calculated.

Balance ($)	Interest
B≤15,000	1%
15,000<B≤20,000	1.5%
B>20,000	2%

Write a script that displays in the command window, for each of the 12 months, **with informative headers**, the:

1. Number of the current month
2. Interest rate for current month as a percentage (e.g. 1.5 and not 0.015)
3. total amount of interest earned that month (with two decimal places)
4. New balance (with two decimal places)
5. Total interest earned (running total of the cumulative interest earned from the opening deposit)

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Your last row should be:  12   2.0%   $470.29   $24984.92   $2984.92
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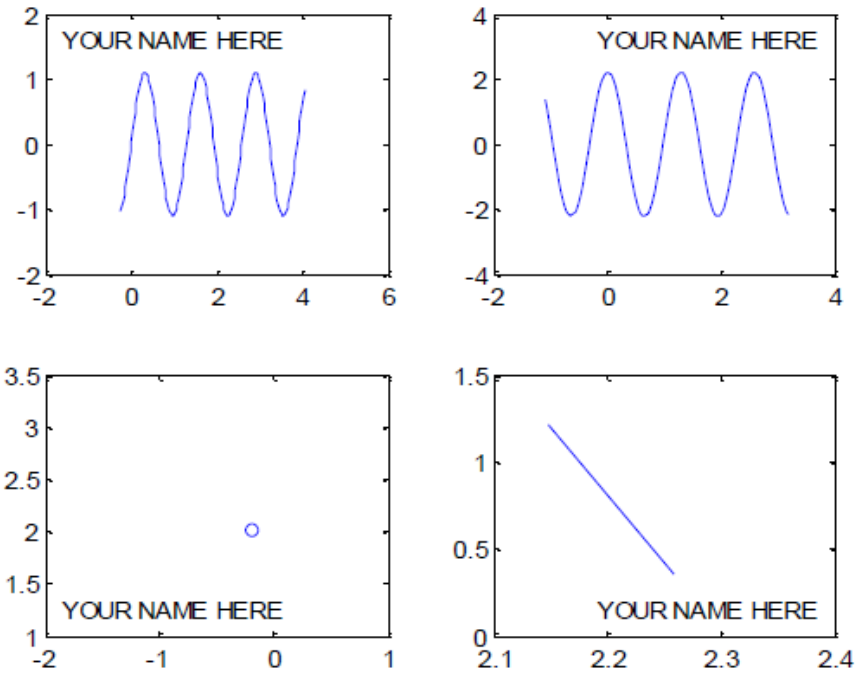
Problem 7 Place your name in the right corner as shown in the figure. For this assignment, the code for the plots are given and you are expected to create a user defined function that places your name in the corner of any plot.

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%%
% This MATLAB script tests a user-defined function that places a name
% on randomly sized plots.

%% Generate randomized data to plot
clear all;clc;

% x data
xmin = (-10) + (10-(-10)).*rand; %Generate random number between -10
and 10
xrange = 2 + (5-2).*rand; %Generate random number between 2 and 5
xmax = xmin + xrange;
numPts = 150; %Number of data points
x = linspace(xmin,xmax,numPts);
x2 = x-0.2*xrange;

% y data
Amp = 0.5 + (2-0.5).*rand; %Generate random amplitude between 0.5 and 2
Freq = 0.5 + (1.5-0.5).*rand; %Generate random freq between 0.5 and 1.5
y = Amp*sin(2*pi*Freq*x);
y2 = 2*Amp*cos(2*pi*Freq*x2);

%% Plot data and test your function
r = 2; %number of subplot rows
c = 2; %number of subplot columns

subplot(r,c,1)
plot(x,y)
%****************************
%TYPE THE NAME OF YOUR FUNCTION HERE TO PUT YOUR NAME IN THE UPPER LEFT
%****************************
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subplot(r,c,2)
plot(x2,y2)
%****************************
%TYPE THE NAME OF YOUR FUNCTION HERE TO PUT YOUR NAME IN THE UPPER
RIGHT
%****************************

subplot(r,c,3)
plot(-5*rand,3*rand,'o')
%****************************
%TYPE THE NAME OF YOUR FUNCTION HERE TO PUT YOUR NAME IN THE LOWER LEFT
%****************************

subplot(r,c,4)
plot([5*rand 5*rand],[2*rand,6*rand])
%****************************
%TYPE THE NAME OF YOUR FUNCTION HERE TO PUT YOUR NAME IN THE LOWER
RIGHT
%****************************
```