Empirical Methods Homework 1

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Question 1:

Code:

```
% Define vector X
x = [1, 1.5, 3, 4, 5, 7, 9, 10];

% Compute The Values for y1 = -2 + 0.5x
y1 = -2 + 0.5.*x;

% Display y1
disp(y1')
```
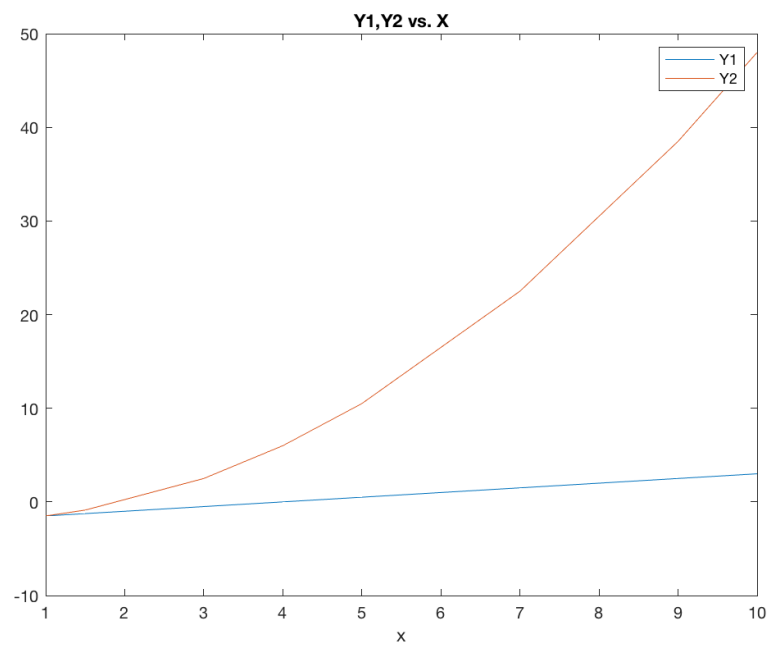
```
   -1.5000
   -1.2500
   -0.5000
         0
    0.5000
    1.5000
    2.5000
    3.0000
```

```
% Compute the values for y2
y2 = -2 + 0.5 .* x.^2;

% Display y2
disp(y2')
```

```
   -1.5000
   -0.8750
    2.5000
    6.0000
   10.5000
   22.5000
   38.5000
   48.0000
```

```
% Plot Y1, Y2 vs X
figure
plot(x, y1, x, y2)
title("Y1,Y2 vs. X")
xlabel("x")
legend("Y1", "Y2")
```


Question 2

Code:

```
% Create x vector
x = linspace(-10, 20, 200)';

% Calculate and display sum of the elements of x
sum_x = sum(x)
```

```
sum_x = 1000
```

Question 3

Code:

```matlab
% Create A matrix
A = [2, 4, 6; 1, 7, 5; 3, 12, 4];

% Create vector b
b = [-2;3;10];

% Calculate and display C=A'b
C = A'*b
```

```
C  =  3x1
     29
    133
     43
```

```matlab
% Calculate and display D=((A'A)^(-1))*b
D = inv(A'*A)*b
```

```
D  =  3x1
    -3.2505
     0.3961
     0.8037
```

```matlab
% Calculate and Display E= sum_i (sum_j aij*bi)
E = sum(sum(A.*b))
```

```
E  =  205
```

```matlab
% F matrix is matrix with the 2nd row and 3rd ...
    column deleted

% Initialize F to A
F = A;

% Delete 2nd row
F(2,:)  =  [];

% Delete 3rd column and display F
F(:,3) = []
```

```
F  =  2x2
      2       4
      3      12
```

```
% Solve the system Ax=b
x = A\b
```

```
x  =  3x1
    -0.1622
     1.2432
    -1.1081
```

Question 4

Code:

```
% Create block diagonal matrix

% Initialize B to a 15 x 15 zero matrix
B = blkdiag(A,A,A,A,A)
```

```
B =  15×15
     2    4    6    0    0    0    0    0    0    0    0    0    0    0    0
     1    7    5    0    0    0    0    0    0    0    0    0    0    0    0
     3   12    4    0    0    0    0    0    0    0    0    0    0    0    0
     0    0    0    2    4    6    0    0    0    0    0    0    0    0    0
     0    0    0    1    7    5    0    0    0    0    0    0    0    0    0
     0    0    0    3   12    4    0    0    0    0    0    0    0    0    0
     0    0    0    0    0    0    2    4    6    0    0    0    0    0    0
     0    0    0    0    0    0    1    7    5    0    0    0    0    0    0
     0    0    0    0    0    0    3   12    4    0    0    0    0    0    0
     0    0    0    0    0    0    0    0    0    2    4    6    0    0    0
     :
     :
```

Question 5

Code:

```
% Create 5x3 matrix of randome distributions with ...
    mu =  10 and std = 5

A = 10 + 5*randn(5,3)
```

```
A  =  5x3
    12.6883    3.4616    3.2506
```

4

```
    19.1694      7.8320     25.1746
    - 1.2942     11.7131     13.6270
    14.3109     27.8920      9.6847
    11.5938     23.8472     13.5737
```

```matlab
% Replace the elements of A that are less than 10 ...
    with 0
A(A < 10) = 0;

% Replace the elements of A that are equal or ...
    greater tan 10 with 1
A(A > = 10) = 1
```

```
A  =  5x3
     1       0       0
     1       0       1
     0       1       1
     1       1       0
     1       1       1
```

Question 6

Code:

```matlab
% Import CSV file
data  =  csvread('datahw1.csv');

T = readtable('datahw1.csv', 'ReadVariableNames', ...
    false);

% Modify variable names
T.Properties.VariableNames  =  {'FirmID', 'Year', ...
    'Export', 'RD', 'prod', 'cap'}

fitlm(T,'prod~Export +RD+ cap')
```

```
Linear regression model:
    prod ~ 1 + Export + RD + cap

Estimated Coefficients:
                   Estimate        SE        tStat       pValue
                   _____    _____    _____    _____

    (Intercept)    0.082548     0.016719     4.9374       8.21e-07
    Export          0.11985    0.0063193     18.966     3.7356e-77
    RD              0.13992    0.0085321     16.399     1.0565e-58
    cap            0.029443    0.0017827     16.516     1.7144e-59


Number of observations: 4389, Error degrees of freedom: 4385
Root Mean Squared Error: 0.178
R-squared: 0.353,   Adjusted R-Squared 0.353
F-statistic vs. constant model: 798, p-value = 0
```