MAT 343 MATLAB LAB 5 **NAME: _Hieu Pham____**

```
%Lab 5 - Question 1
x = [1:1:100]';
%Note the prime
y = randn(size(x));
% a column vector of 100 standard normal values.
X = [ones(size(x)),x];
% build the matrix X for linear model
z = X'*y;
% right hand side of the Normal Equations
S = X'*X;
% Left hand side of the Normal Equations
U = chol(S);
% Cholesky decomposition
w = U'\z;
% solve the normal equations using the Cholesky decomposition


c = U\w;
plot(x,y,'.','MarkerSize',7)
% plot the data points
q = 1:0.1:100;
% define a vector for plotting the linear fit


fit = c(1)+c(2)*q;
% define the linear fit
hold on
plot(q,fit,'r');
 % plot the linear fit together with the data points
```

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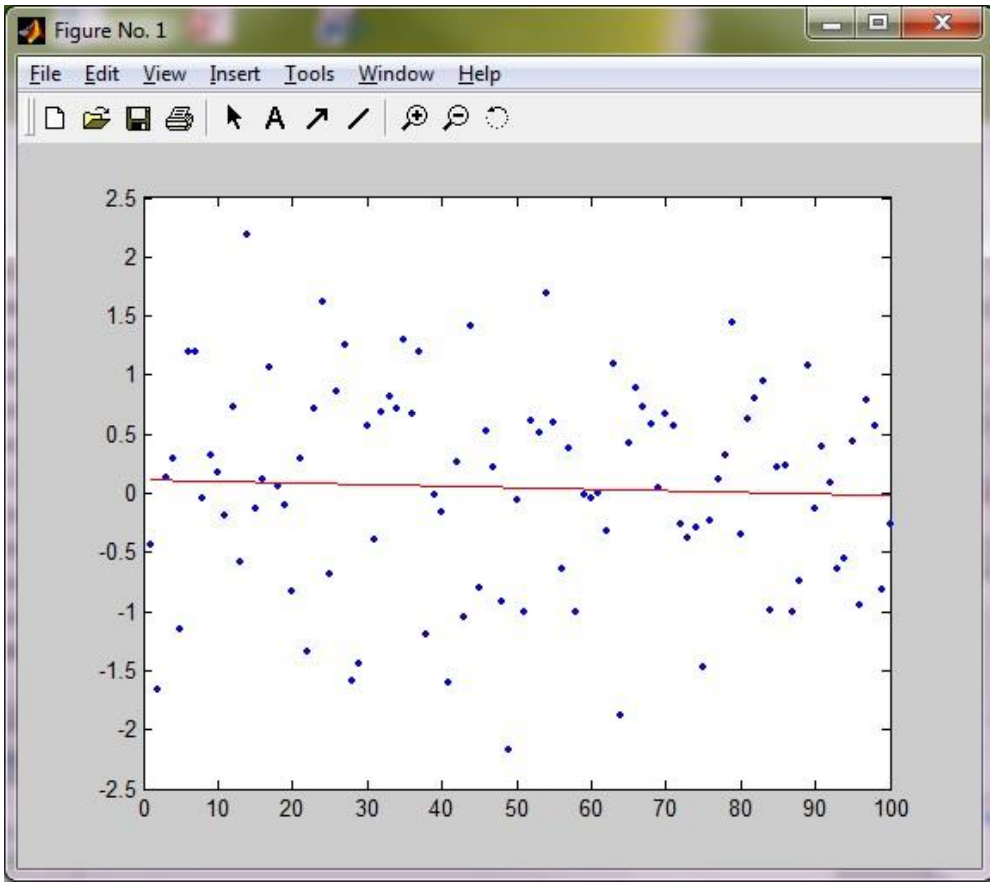


```
format short e
c

c =

  1.1474e-001
 -1.3229e-003

%The equation is y = (1.1474e-001)x - -1.3229e-003

%Question 1, Part B - Observation
%Strong correlations revealed in the composition above are expected due
%to uniform distribution of the points. y formed an nxn matrix consisting of
%P which is the size of  x.
```

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```
%Lab 5 - Question 2
dat=load('co2.dat');
%Load raw data into the dat matrix
year=dat(:,1); %Year is first column
conc=dat(:,2); %Concentration level is second column
plot(year,conc,'o') %Plot out the data
%Lab 5 - QUestion 2 - Part A
%Following example 1 to compute best-fit line
X= [ones(size(year)),year];
z=X'*conc;
S=X'*X;
U=chol(S);
w=U'\z;
format short e
c=U\w

c =

 -2.4718e+003
  1.4204e+000

fit=c(1)+c(2)*year;
hold on
plot(year,fit,'k','linewidth',2)
axis tight
%Lab 5 - Question 2 - Part B
X=[ones(size(year)),year,year.^2];
z=X'*conc;
S=X'*X;
U=chol(S);
w=U'\z

w =

  2.4137e+003
  1.4061e+002
  1.5018e+001

c2=U\w

c2 =
```

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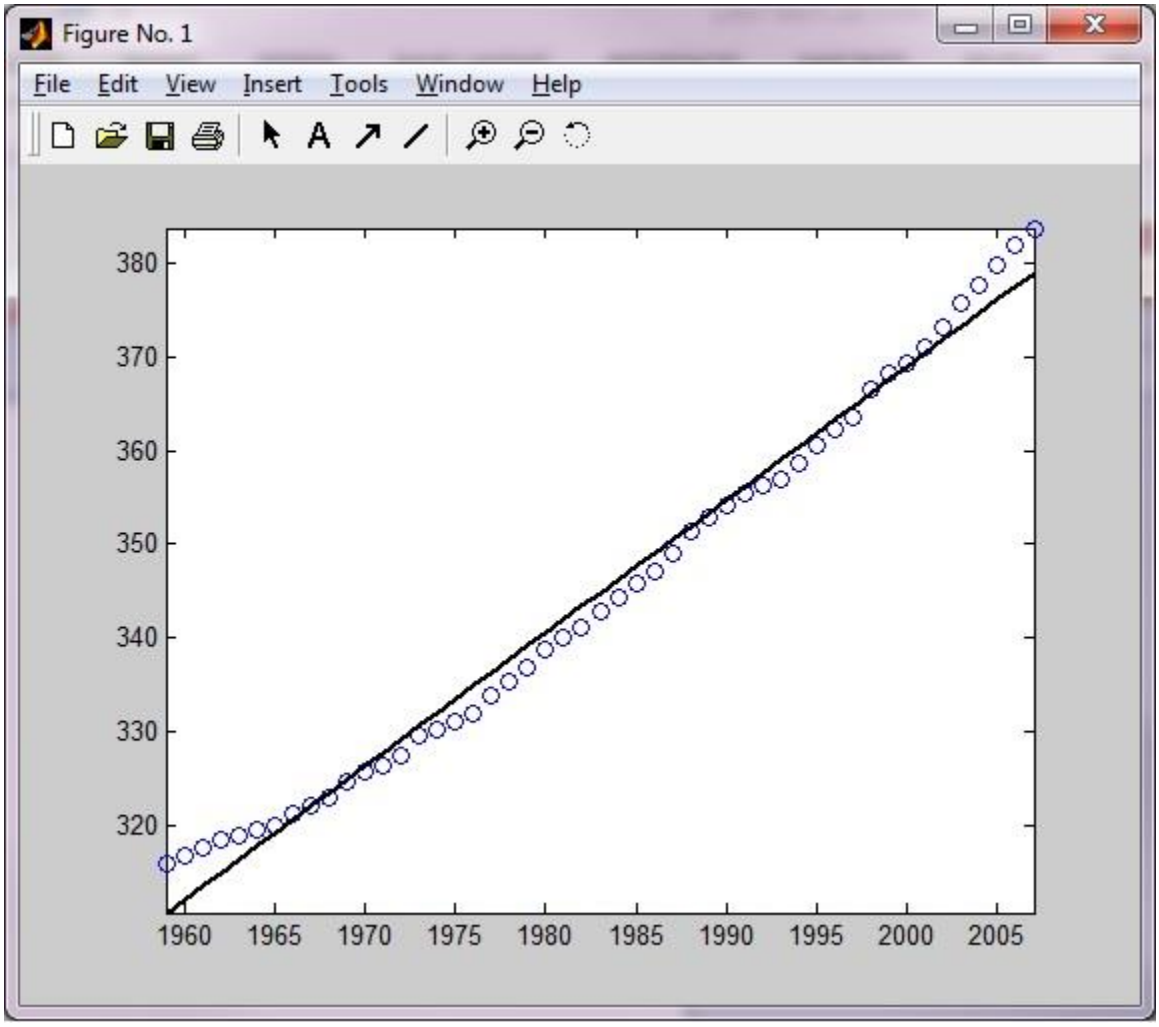
4.4715e+004
-4.6174e+001
1.2000e-002

```
fit2=c2(1)+c2(2)*year+c2(3)*year.^2;
plot(year,fit2,'r','linewidth',2)
legend('data points','linear fit','quadratic fit',2)
```



c (Part A) =

-2.4718e+003
1.4204e+000

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```
w =

  2.4137e+003
  1.4061e+002
  1.5018e+001

c2 (Part B) =

  4.4715e+004
 -4.6174e+001
  1.2000e-002

%Lab 5 - Question 3
format short e
dat = load('co2.dat');
x= [1;2;3;4;5;6;7;8;9;10];
y= [222;227;223;233;244;253;260;266;270;266];
hold on
X = [ones(size(x)),x,x.^2,x.^3];
z = X'*y;
S = X'*X;
U = chol(S);
w = U'\z;
c = U\w

c =

  2.3023e+002
 -1.0309e+001
  3.7302e+000
 -2.3388e-001

w

w =

  7.7919e+002
  5.5158e+001
 -2.9593e+000
 -1.2998e+001

plot(x,y,'.')
```

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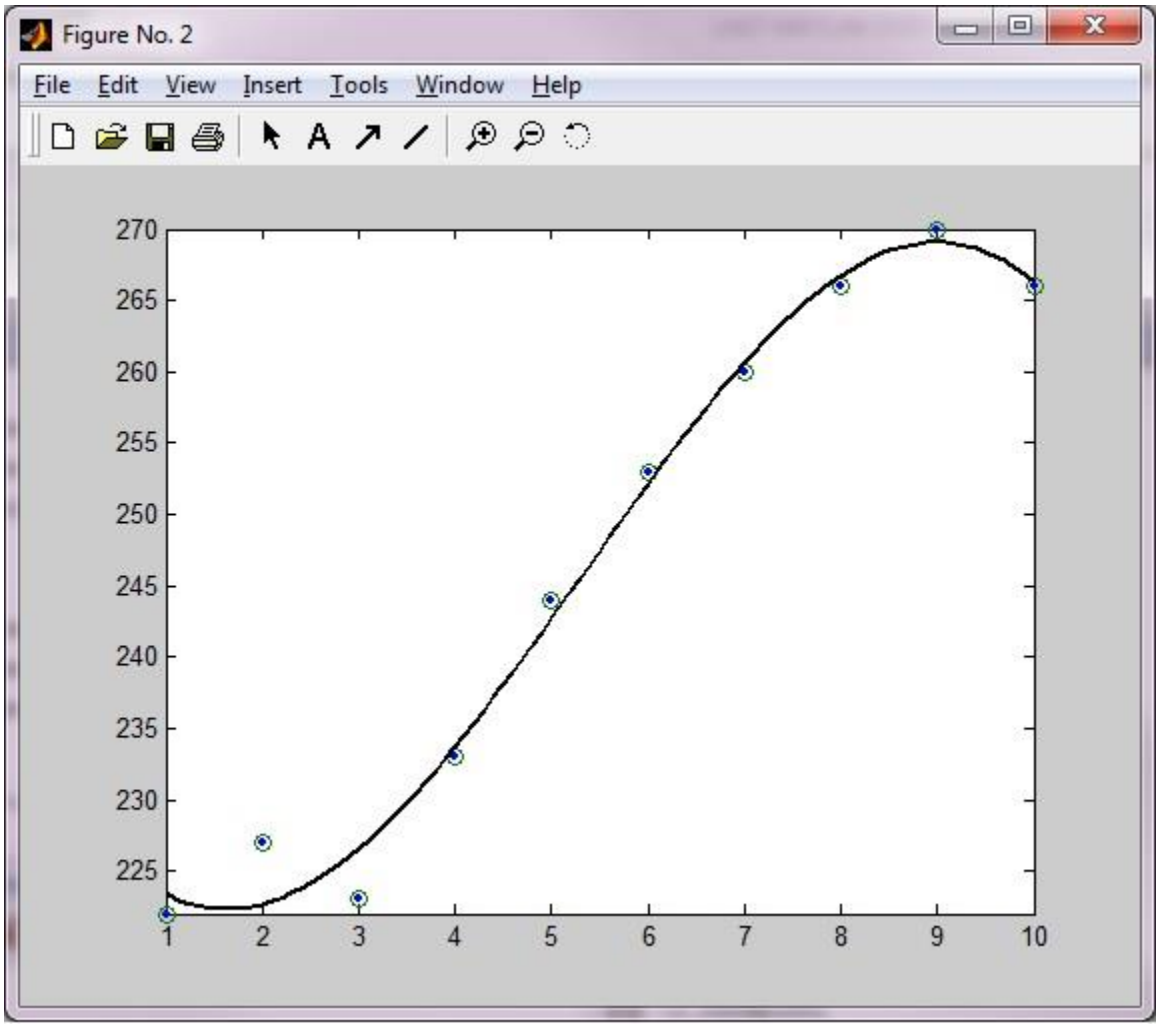
```
axis tight
q = 1:.1:10;
fit = c(1)+c(2)*q+c(3)*q.^2+c(4)*q.^3;
plot(q,fit,'k','linewidth',2);
```



c (Part 2) =

```
  2.3023e+002
 -1.0309e+001
  3.7302e+000
 -2.3388e-001
```

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```
%Lab 5 - Question 3 - Part B
c2 = X\y
c2 =
  2.3023e+002
 -1.0309e+001
  3.7302e+000
 -2.3388e-001

c2 = c2([4:-1:1]);
q2 = 1:.1:10;
z2 = polyval(c2,q2);
figure
plot(q2,z2,x,y,'o');
hold off
%c values for part B
c2
c2 =

 -2.3388e-001
  3.7302e+000
 -1.0309e+001
  2.3023e+002
```