Lab5 - Nikola Uzelac MAT343

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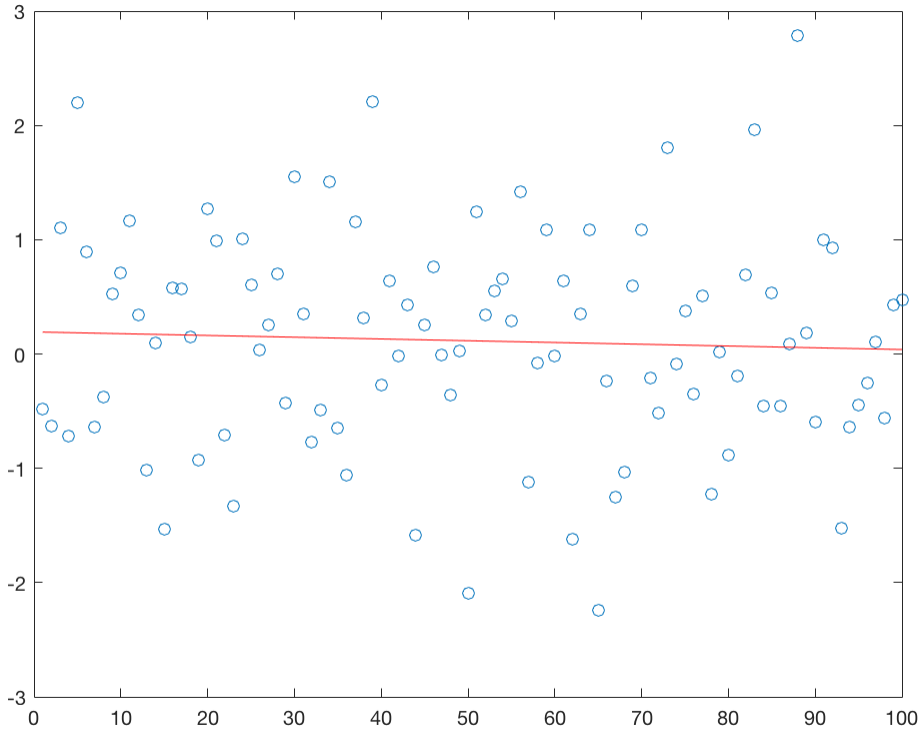
MAT 343 MATLAB Assignment # 5

Question # 1

```
%(a)

% The best straight line model is the one that can fit the data on the
% graph linearly with a slope close to 0


%(b)

format short e

x = [1:1:100]';
y = randn(size(x));

X = [ones(size(x)), x];

z = X' * y;
S = X' * X;

U = chol(S);

w = U'\z;
c = U\w

plot(x,y, 'o')

q = x;

fit = c(1) + c(2) * q;

hold on

plot(q, fit, 'r');

    %(i)

    % Slope: -4.4533e-01
    % Y-Intercept: 5.0652e-03
```

```
    fit = c(1) + c(2) * x;

    plot(x, fit, 'r');

    %(ii)

    % Yes the values confirm my answer as both the values of Y-
Intercept and Slope
    % are close to 0.
```

```
c =

   1.9303e-01
  -1.5417e-03
```



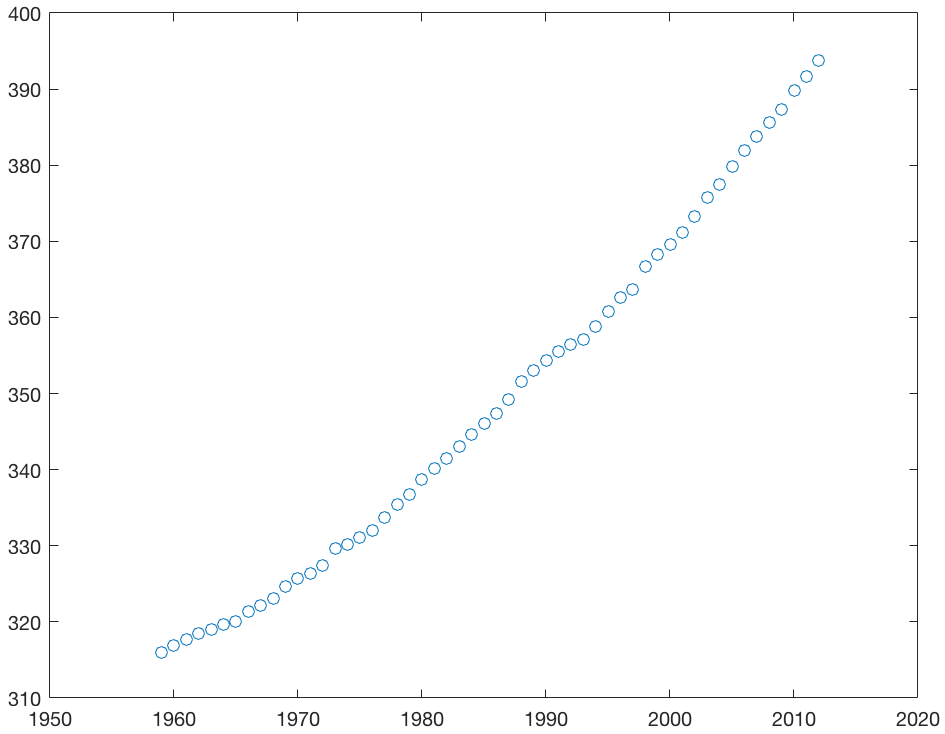
Question # 2

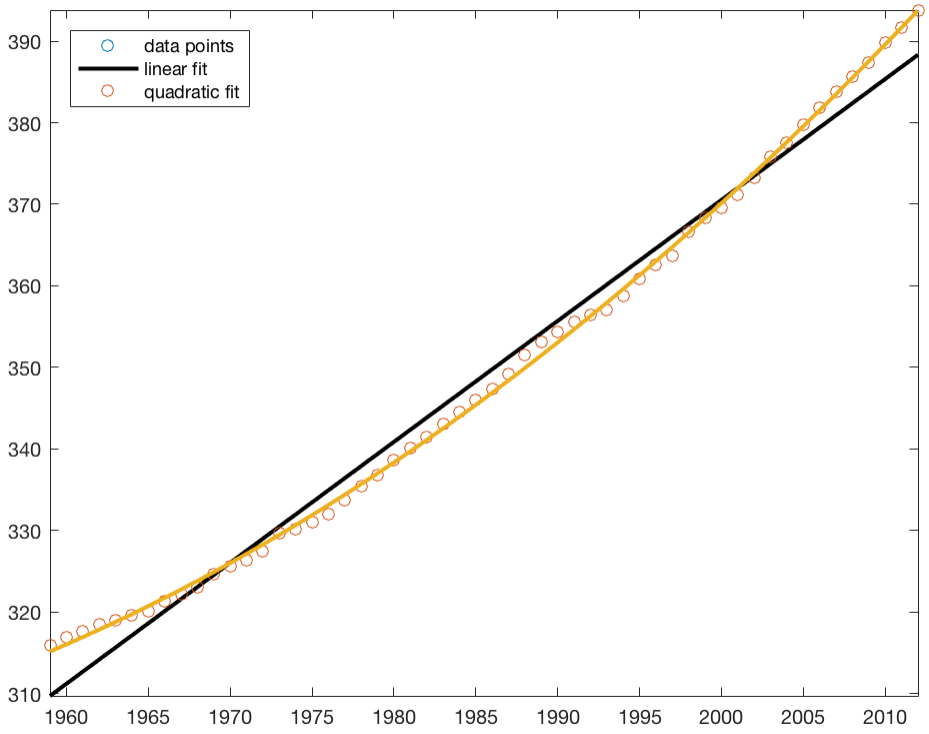
```
figure

dat = load('co2.dat');

x = dat(:,1);
y = dat(:,2);
```

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

figure

% (a)

        X = [ones(size(x)), x];

        z = X' * y;
        S = X' * X;

        U = chol(S);

        w = U'\z;
        c = U\w

        plot(x,y, 'o')

        q = x;

        fit = c(1) + c(2) * q;

        hold on

        axis tight

        plot(q, fit, 'k', 'linewidth', 2);


        % c1 = -2.5955e+03
        % c2 = 1.4830e+00
% (b)

        x = dat(:,1);
        y = dat(:,2);

        X = [ones(size(x)), x, x.^2];

        z = X' * y;
        S = X' * X;

        U = chol(S);

        w = U'\z;
        c = U\w

        plot(x,y, 'o')

        q = x;

        fit = c(1) + c(2) * q + c(3) * q.^2;

        hold on
```

```
        axis tight

        plot(q, fit, 'linewidth', 2);

        legend('data points', 'linear fit', 'quadratic
 fit', 'location', 'northwest')

        % c1 = 4.4149e+04
        % c2 = -4.5606e+01
        % c3 = 1.1858e-02

        figure
```

```
c =

  -2.5955e+03
   1.4830e+00


c =

   4.4149e+04
  -4.5606e+01
   1.1858e-02
```




data points
linear fit
quadratic fit
390
380
370
360
350
340
330
320
310
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010

Question # 3

```
   % (a)

   x = [1;2;3;4;5;6;7;8;9;10;11;12]
   y =
[69.2;77.5;84.7;86.8;90.1;105.9;105.1;107.7;100.3;90.0;73.4;65.4]

       X = [ones(size(x)), x, x.^2, x.^3, x.^4, x.^5];

       z = X' * y;
       S = X' * X;

       U = chol(S);

       w = U'\z;
       c = U\w

       plot(x,y, 'o')

       q = x;

       fit = c(1) + c(2) * q + c(3) * q.^2 + c(4) * q.^3 + c(5) *
q.^4 + c(6) * q.^5 ;

       hold on

       axis tight

       plot(q, fit, 'linewidth', 2);

       % c1 = 4.2877e+01
       % c2 = 3.9841e+01
       % c3 = -1.6978e+01
       % c4 = 3.6134e+00
       % c5 = -3.3493e-01
       % c6 = 1.0812e-02

       figure

  % (b)

   x = [1;2;3;4;5;6;7;8;9;10;11;12]
   y =
[69.2;77.5;84.7;86.8;90.1;105.9;105.1;107.7;100.3;90.0;73.4;65.4]

   X = [ones(size(x)), x, x.^2, x.^3, x.^4, x.^5];

   c = X\T
   c = c([6:-1:1]);
   q = 1:0.1:12;
   z = polyval(c,q);
   figure
```

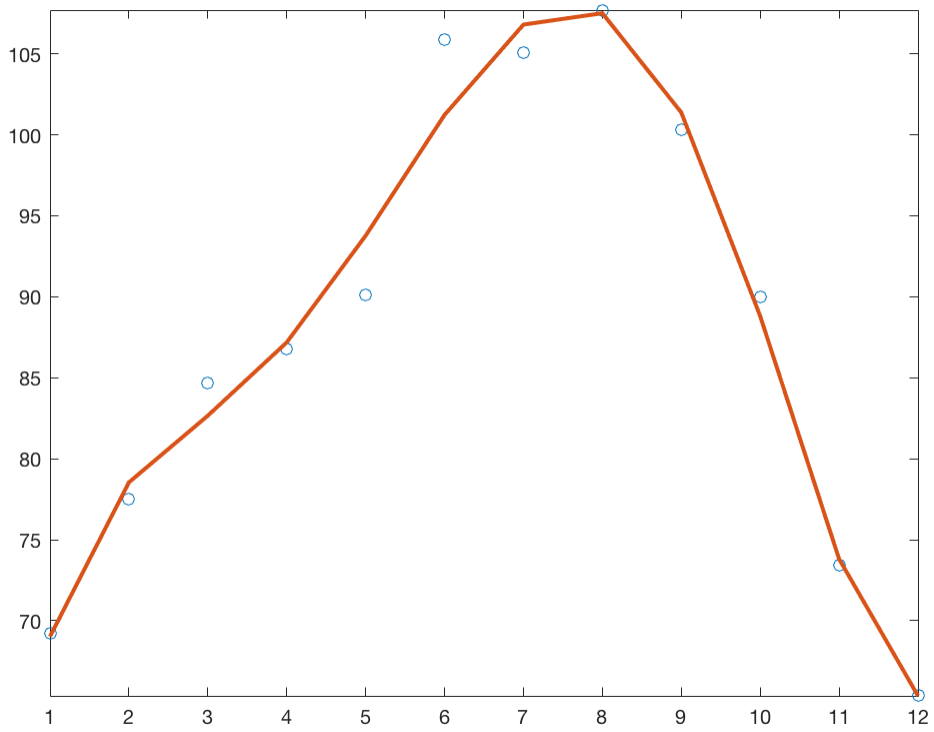
```
    plot(q,z,m,T,'o');
    axis tight

        % c1 = 4.2877e+01
        % c2 = 3.9841e+01
        % c3 = -1.6978e+01
        % c4 = 3.6134e+00
        % c5 = -3.3493e-01
        % c6 = 1.0812e-02

    %(a) They are the same
    %(b) Line is a closer and more accurate fit to the data set
```

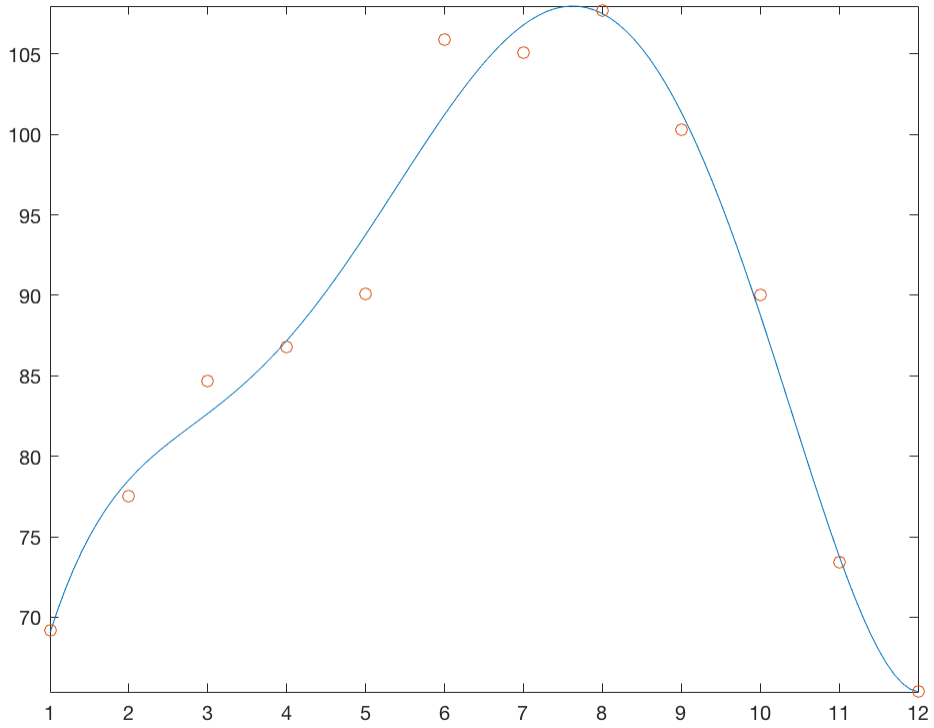
```
x =

     1
     2
     3
     4
     5
     6
     7
     8
     9
    10
    11
    12
```

```
y =

   6.9200e+01
   7.7500e+01
   8.4700e+01
   8.6800e+01
   9.0100e+01
   1.0590e+02
   1.0510e+02
   1.0770e+02
   1.0030e+02
   9.0000e+01
   7.3400e+01
   6.5400e+01
```

```
c =

   4.2877e+01
   3.9841e+01
  -1.6978e+01
   3.6134e+00
  -3.3493e-01
   1.0812e-02
```

```
x =

     1
     2
     3
     4
     5
     6
     7
     8
     9
    10
    11
    12


y =

   6.9200e+01
   7.7500e+01
   8.4700e+01
   8.6800e+01
   9.0100e+01
   1.0590e+02
   1.0510e+02
   1.0770e+02
   1.0030e+02
   9.0000e+01
   7.3400e+01
   6.5400e+01


c =

   4.2877e+01
   3.9841e+01
  -1.6978e+01
   3.6134e+00
  -3.3493e-01
   1.0812e-02
```


105
100
95
90
85
80
75
70
1
2
3
4
5
6
7
8
9
10
11
12



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