
Table of Contents

Example 9 - more least squares regression	1
Problem 1	1
Problem #2	2
Problem #3	4

Example 9 - more least squares regression

```
clear
clc
close 'all'
```

Problem 1

```
fprintf('\nProblem 6.6 \n');

% data
x = [1 2 3 5 8]';
y = [0.5 1.9 2.2 3 3.5]';

% plot the data
figure(1)
plot(x,y,'sk','markersize',10,'linewidth',2);
title('Least Squares Problem 6.6 ','fontsize',18,'fontweight','bold');
xlabel('X','fontsize',16,'fontweight','bold');
ylabel('Y','fontsize',16,'fontweight','bold');
grid on
set(gca,'fontsize',12,'fontweight','bold');
axis([0 9 0 4]);

% linearized estimator
X = [x.^0 x.^(0.5)];
b = y.^2;

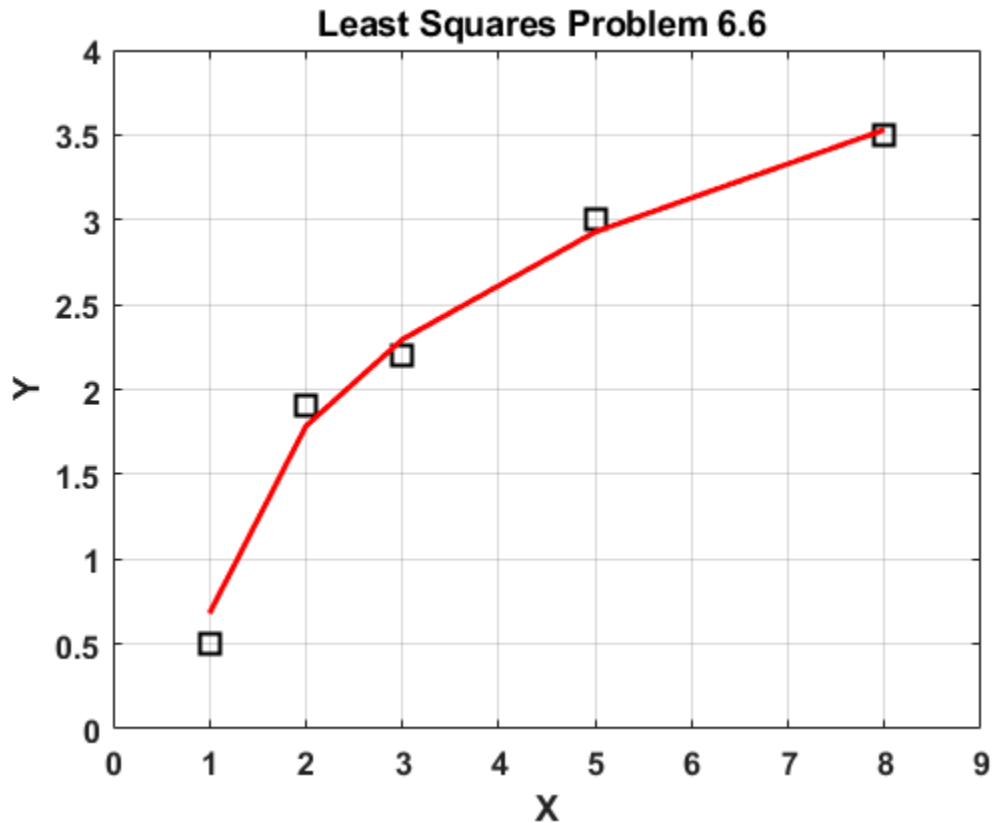
C = (X'*X)\(X'*b);
fprintf('m = %g \n',C(2));
fprintf('b = %g \n',C(1));

%remember to "undo" the linearizing transformation
est1 = @(x) sqrt(C(1) + C(2)*sqrt(x));

figure(1)
plot(x,y,'sk',...
      x,est1(x),'-r','markersize',10,'linewidth',2);
title('Least Squares Problem 6.6 ','fontsize',18,'fontweight','bold');
xlabel('X','fontsize',16,'fontweight','bold');
ylabel('Y','fontsize',16,'fontweight','bold');
grid on
```

```
set(gca,'fontsize',12,'fontweight','bold');
axis([0 9 0 4]);
```

Problem 6.6
 $m = 6.56315$
 $b = -6.10032$



Problem #2

```
fprintf('\n\nProblem 6.5 \n');

% data
x = [-2 -1 0 1 2]';
y = [1.5 3.2 4.5 3.4 2]';

% plot the data
figure(2)
plot(x,y,'sk','markersize',10,'linewidth',2);
title('Least Squares Problem 6.6 ','fontsize',18,'fontweight','bold');
xlabel('X','fontsize',16,'fontweight','bold');
ylabel('Y','fontsize',16,'fontweight','bold');
grid on
set(gca,'fontsize',12,'fontweight','bold');
axis([-2.5 2.5 1.5 5]);
```

```
% linearized estimator
X = [x.^0 x.^2];
b = y.^(-1);

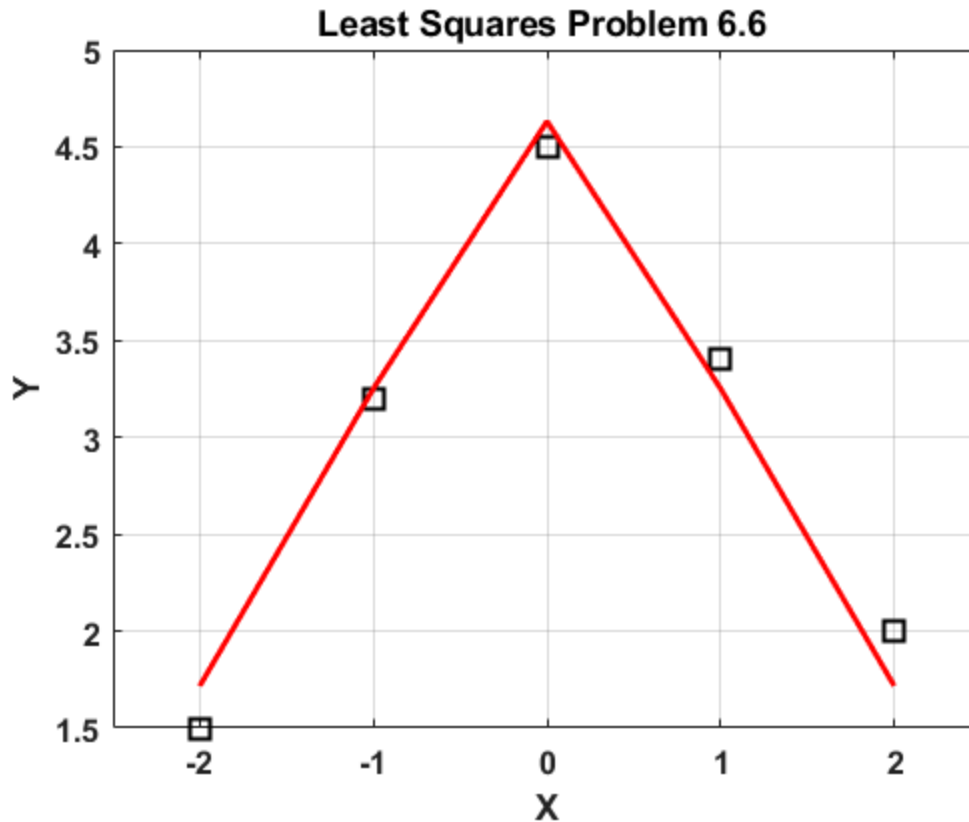
C = (X'*X)\(X'*b);

% remember to "undo" the linearizing transformation
a = 1./C(2);
b = C(1)*a;

fprintf('a = %g \n',a);
fprintf('b = %g \n',b);

est2 = @(x) a./(x.^2 + b);
% plot again
figure(2)
plot(x,y,'sk',...
      x,est2(x),'-r','markersize',10,'linewidth',2);
title('Least Squares Problem 6.6 ','fontsize',18,'fontweight','bold');
xlabel('X','fontsize',16,'fontweight','bold');
ylabel('Y','fontsize',16,'fontweight','bold');
grid on
set(gca,'fontsize',12,'fontweight','bold');
axis([-2.5 2.5 1.5 5]);
```

Problem 6.5
a = 10.9181
b = 2.35744



Problem #3

```
fprintf('\n\nProblem 6.8 \n');

% data
T = [-40 -20 0 20 40]';
W = [0.0012 0.002 0.0032 0.006 0.0118]';

% plot the data
figure(3)
plot(T,W, 'sk', 'markersize',10, 'linewidth',2);
title('Least Squares Problem 6.8 ', 'fontsize',18, 'fontweight', 'bold');
xlabel('Temperature ^{\circ}C', 'fontsize',16, 'fontweight', 'bold');
ylabel('Water Solubility (% wt.)', 'fontsize',16, 'fontweight', 'bold');
grid on
set(gca, 'fontsize',12, 'fontweight', 'bold');
axis([-45 45 0 0.0135]);

X = [T.^0 T.^1];
b = log(W);

C = (X'*X)\(X'*b);

% log(b) = C(1)
b = exp(C(1));%<-- note: over-writing other value of b
```

```

m = C(2);
fprintf('b = %g \n',b);
fprintf('m = %g \n',m);

est3 = @(x) b*exp(m*x);

% plot the data again
figure(3)
plot(T,W,'sk',...
      T,est3(T),'-r','markersize',10,'linewidth',2);
title('Least Squares Problem 6.8 ','fontsize',18,'fontweight','bold');
xlabel('Temperature ^{\circ}C','fontsize',16,'fontweight','bold');
ylabel('Water Solubility (% wt.)','fontsize',16,'fontweight','bold');
grid on
set(gca,'fontsize',12,'fontweight','bold');
axis([-45 45 0 0.0135]);

fprintf('Solubility at 10 degrees C = %g \n',est3(10));

```

Problem 6.8
b = 0.00352435
m = 0.0283508
Solubility at 10 degrees C = 0.00467956

