
Homework 08 - Steve Mazza

Table of Contents

Problem 1	1
Problem 2	2
Problem 3	3
Problem 4	5

Problem 1

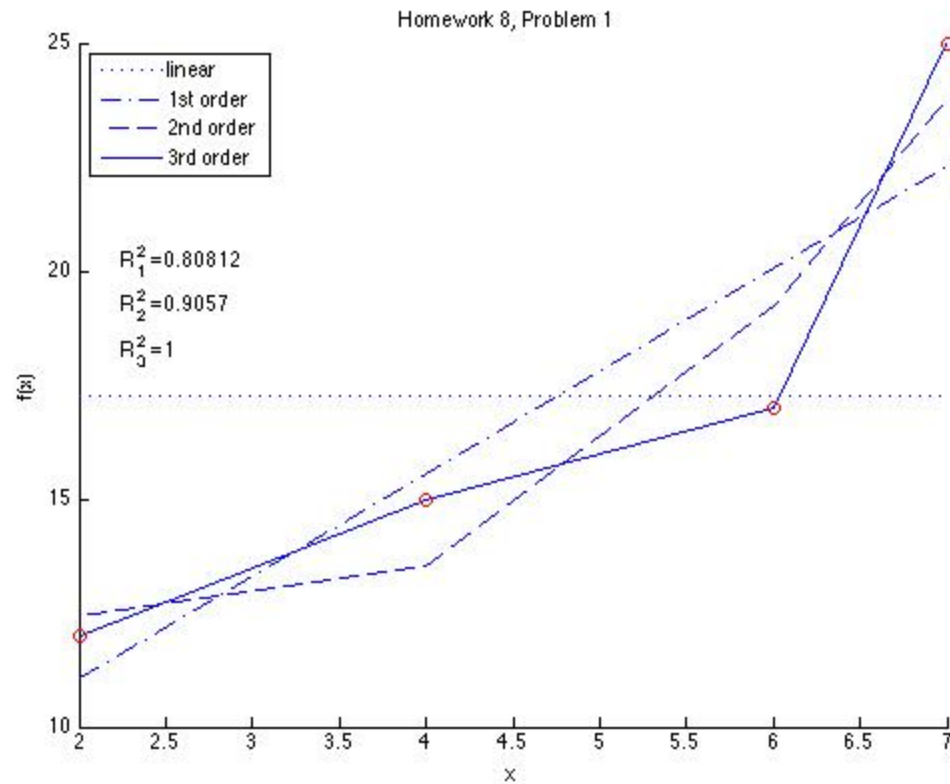
```
clc; clear all; close all;

xd = [2 4 6 7];
yd = [12 15 17 25];

% Compute least squares regressions.
[p0,s0] = polyfit(xd,yd,0);
[p1,s1] = polyfit(xd,yd,1);
[p2,s2] = polyfit(xd,yd,2);
[p3,s3] = polyfit(xd,yd,3);

% Estimate coefficient of determination for R^2.
St=std(yd)^2*(3);
Rsqr1=(St-s1.normr^2)/St;
Rsqr2=(St-s2.normr^2)/St;
Rsqr3=(St-s3.normr^2)/St;

% Plot the results along with the original data.
hold on;
plot(xd,polyval(p0,xd),' : ');
plot(xd,polyval(p1,xd),' - . ');
plot(xd,polyval(p2,xd),' -- ');
plot(xd,polyval(p3,xd),' - ');
title('Homework 8, Problem 1');
xlabel('x');
ylabel('f(x)');
legend('linear', '1st order', '2nd order', '3rd order', ...
       'Location', 'NorthWest');
plot(xd,yd,'ro');
text(2.25,20, strcat('R^2_1 = ',num2str(Rsqr1)));
text(2.25,19, strcat('R^2_2 = ',num2str(Rsqr2)));
text(2.25,18, strcat('R^2_3 = ',num2str(Rsqr3)));
```



Problem 2

```
clc; clear all; close all;

xd = [-20 0 20 40 60 80 100 120];
yd = [4 0.38 0.095 0.032 0.015 0.0078 0.0045 0.0032];

% Plot u=f(T).
subplot(3,1,1);
plot(xd,yd,'ro');
hold on;
[p,s] = polyfit(xd,yd,1);
plot(xd,polyval(p,xd));
title('Linear Fit');
xlabel('Temperature (Celsius)');
ylabel('Viscosity');

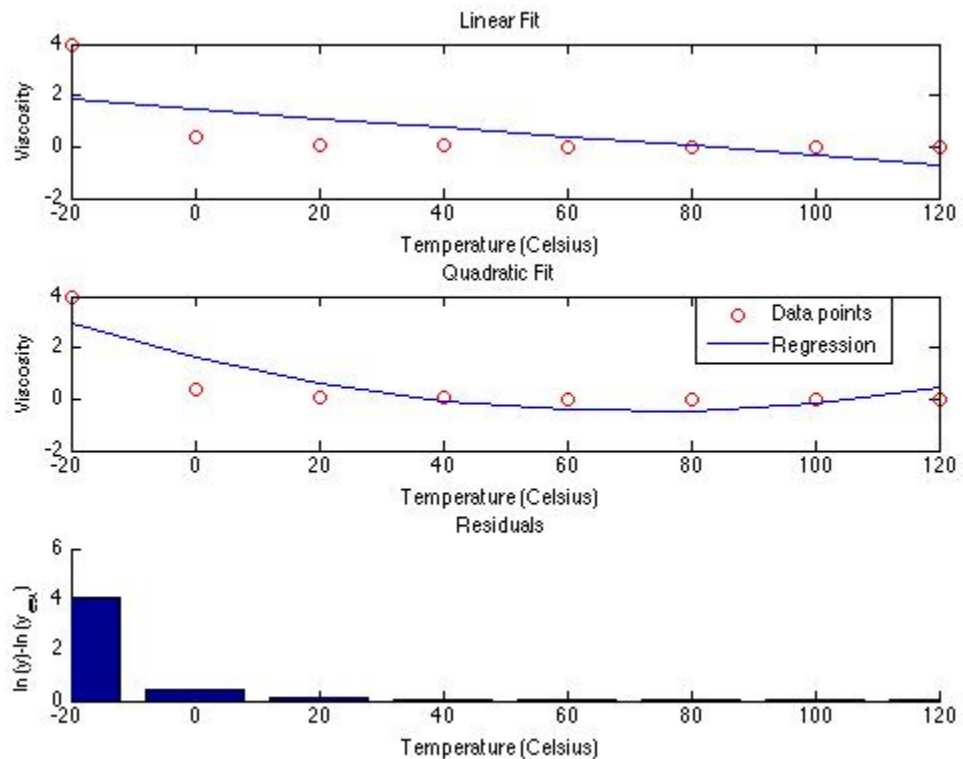
% Find the quadratic regression.
subplot(3,1,2);
plot(xd,yd,'ro');
hold on;
[p,s] = polyfit(xd,yd,2);
plot(xd,polyval(p,xd));
title('Quadratic Fit');
xlabel('Temperature (Celsius)');
```

```

ylabel('Viscosity');
legend('Data points','Regression',0);

% Plot the residuals.
subplot(3,1,3);
hold on;
bar(xd,yd-p(1)*xd-p(2));
xlim([-20 120]);
title('Residuals');
xlabel('Temperature (Celsius)');
ylabel('ln(y)-ln(y_{est})');

```



Problem 3

```

clc; clear all; close all;

xd = [0 1 2 10 50 100];
yd = [100 45 39 22 5 0.5];

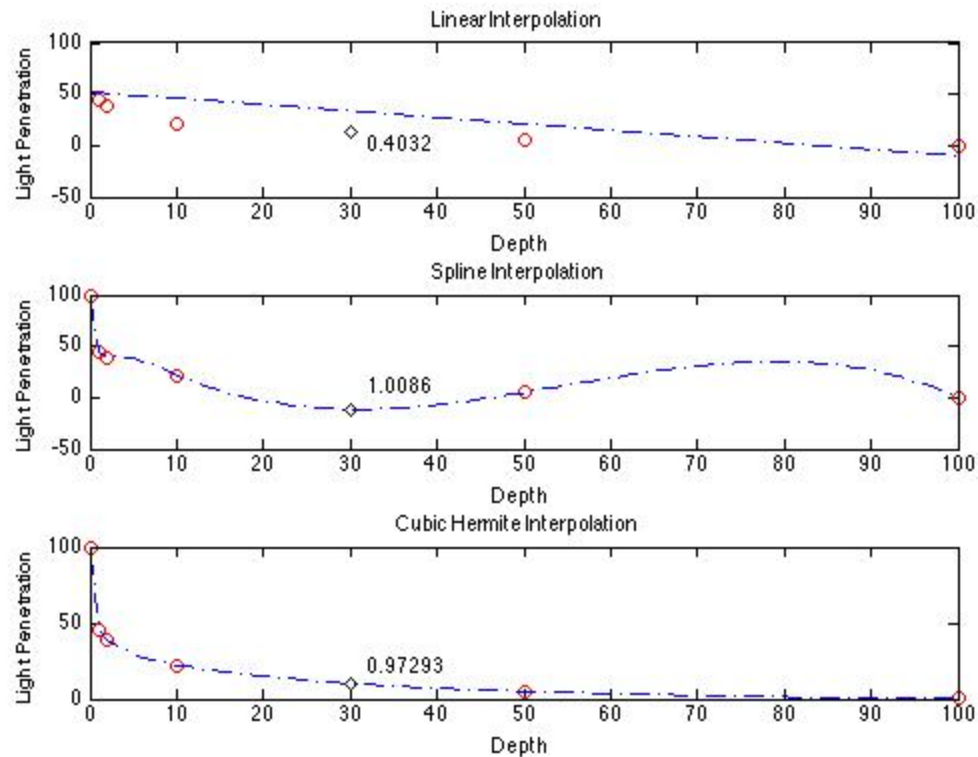
% Plot u=f(T).
subplot(3,1,1);
plot(xd,yd,'ro');
hold on;
title('Linear Interpolation');
xlabel('Depth');
ylabel('Light Penetration');

```

```
yy = interp1(xd,yd,30,'linear');
x = linspace(0,100);
[p,s] = polyfit(xd,yd,1);
plot(xd,polyval(p,xd),'-');
plot(30,yy,'kd');
text(32,0,num2str(yy/polyval(p,30)));

subplot(3,1,2);
plot(xd,yd,'ro');
hold on;
title('Spline Interpolation');
xlabel('Depth');
ylabel('Light Penetration');
yy = interp1(xd,yd,30,'spline');
x = linspace(0,100);
s = spline(xd,yd,x);
plot(x,s,'-');
plot(30,yy,'kd');
text(32,10,num2str(yy/s(30)));

subplot(3,1,3);
plot(xd,yd,'ro');
hold on;
title('Cubic Hermite Interpolation');
xlabel('Depth');
ylabel('Light Penetration');
yy = interp1(xd,yd,30,'pchip');
x = linspace(0,100);
s = pchip(xd,yd,x);
plot(x,s,'-');
plot(30,yy,'kd');
text(32,20,num2str(yy/s(30)));
```



Problem 4

```

clc; clear all; close all;

formatIn = 'dd-mmm-yyyy';

xdate = [datenum('01-May-2013',formatIn) datenum('29-May-2013',formatIn)...
         datenum('26-Jun-2013',formatIn) datenum('24-Jul-2013',formatIn)];
ysunrise = [4*60+59 4*60+34 4*60+32 4*60+50];
ysunset = [18*60+53 19*60+19 19*60+32 18*60+21];

[psunrise, ssunrise] = polyfit(xdate,ysunrise,3);
[psunset,ssunset] = polyfit(xdate,ysunset,3);

% Calculate sunset on the 4th of July.
jfour = datenum('04-Jul-2013',formatIn);
jfoursunsettime = polyval(psunset,jfour);
jfoursunsethour = floor(jfoursunsettime/60);
jfoursunsetminute = rem(fix(jfoursunsettime),60);
fprintf('\n\nSunset on July 4th should be %d hr %d min.\n', ...
        jfoursunsethour,jfoursunsetminute);

% Calculate date and time of earliest sunrise.
x = min(xdate):1:max(xdate);
yallsunrises = polyval(psunrise,x);

```

```
earliestsunrisetime = min(yallsunrises);
earliestsunrisetimehour = floor(earliestsunrisetime/60);
earliestsunrisetiminute = rem(fix(earliestsunrisetime),60);
earliestsunrisedate = ...
    datestr(x(find(yallsunrises==earliestsunrisetime)));
fprintf('The earliest sunrise occurs on %s at %d hr %d min.\n', ...
    earliestsunrisedate,earliestsunrisetimehour,earliestsunrisetiminute);

% Calculate date and length of the longest day.
yallsunsets = polyval(psunset,x);
alldaylengths = yallsunsets - yallsunrises;
longestday = max(alldaylengths);
longestdayhour = floor(longestday/60);
longestdayminute = rem(fix(longestday),60);
longestdaydate = datestr(x(find(alldaylengths == longestday)));
fprintf('The longest day occurs on %s and lasts %d hr %d min.\n', ...
    longestdaydate,longestdayhour,longestdayminute);
```

*Sunset on July 4th should be 19 hr 23 min.
The earliest sunrise occurs on 14-Jun-2013 at 4 hr 30 min.
The longest day occurs on 18-Jun-2013 and lasts 15 hr 3 min.*

Published with MATLAB® R2013a