```matlab
% Liam Fruzyna
% COSC 4540
% Homework 5
% 4.2 CP #9e

clear all
close all

%Least-squares fit of f = a1 + a2*cos(2pit) + a3sin(2pit) + a4*cos(4pit)
%Enter y and t data
y = [362.05 ... 389.83];

N = length(y);
t = [1:N]; %(measured i nyears)
plot(t,y)

%Construct the A matrix
Acol1 = ones(N,1);
Acol2 = t';
Acol3 = cos(2*pi*t)';
Acol4 = sin(2*pi*t)';
Acol5 = (t.^2)';
Acol6 = cos(4*pi*t)';

A = [Acol1,Acol2,Acol3,Acol4,Acol5,Acol6];

%Solve the normal equations
ATA = A'*A;
ATb = A'*y;
xls = ATA\ATb;

%Construct and plot the model function
yfit = xls(1) + xls(2)*t + xls(3)*cos(2*pi*t) + xls(4)*sin(4*pi*t) + xls(5)*(t.^2) +
xls(6)*cos(2*pi*t);
yfit = yfit';
hold on
plot(t,yfit,'r')

%Calculate RMSE
RMSE = sqrt(sum((yfit - y).^2)/N)

may04 = yfit(125)
eMay04 = abs(380.63 - may04)
sept04 = yfit(129)
eSept04 = abs(374.06 - sept04)
may05 = yfit(137)
eMay05 = abs(382.45 - may05)
sept05 = yfit(141)
eSept05 = abs(376.73 - sept05)
```

The error is at the lowest when the most factors are involved. But the first factor added in part c has a much smaller effect than that in part d.

	Parts A&B	Error	Part C	Error	Part D	Error	Part E	Error
RMSE	2.223		2.2233		2.2307		2.2930	
May 2004	381.5716	0.9416	381.5000	0.8700	381.4381	0.8081	381	0.3700
Sept 2004	382.0206	7.9606	382	7.9400	381.9991	7.9391	381	6.9400
May 2005	382.9185	0.4685	382.8750	0.4250	383.1268	0.6768	382	0.4500
Sept 2005	384.1386	7.4086	384.1250	7.3950	384.1936	7.4636	383	6.2700