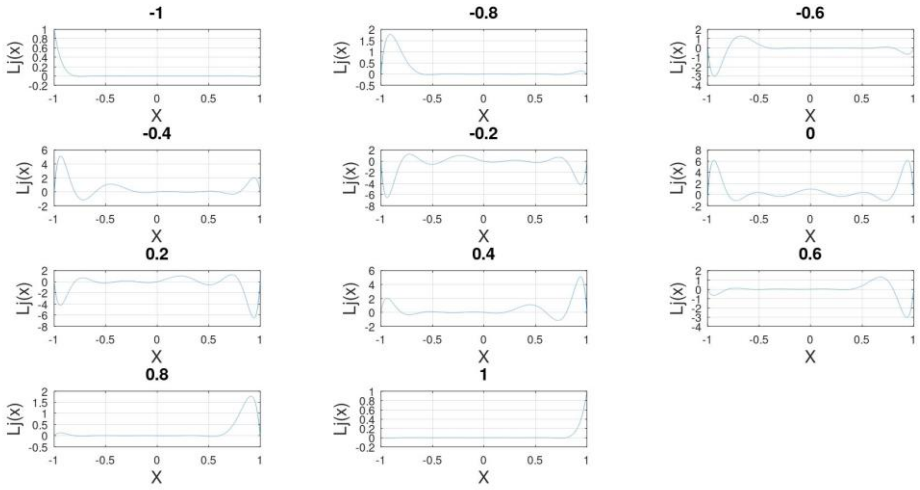
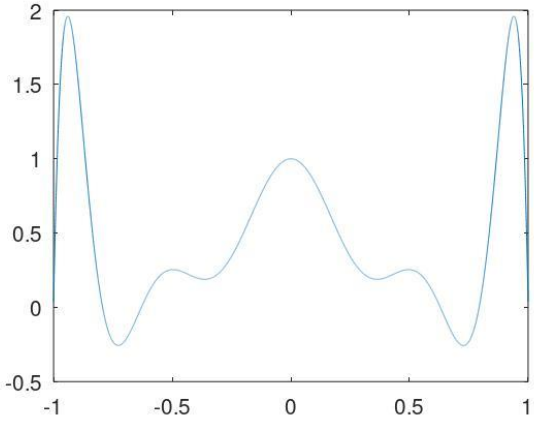
B10505005 工海二 蔣依倢

A1



A2



A1 code

```
filename = "hw1AB.dat";
[datax, datay] = textread(filename,"%f %f","headerlines",1);
    #read data from a text file
    #The file filename is read and parsed according to format.
    #"headerlines": The first value number of lines of filename are skipped.
x0 = datax;
y0 = datay;
x = linspace(-1, 1, 5000)
    #從-1至1分割出500個數字
d = size(x0, 1);
    #Return a row vector with the size (number of elements) of each dimension for the object x0.
    #When given a second argument, dim, return the size of the corresponding dimension.\
    # d 代表 x0 的行數
y = zeros(d, 5000);
y = y+1;

for j = 1:d
  for i = 1:d
    if j == i
      continue;
          #skip and continue the loop
    endif
    y(j, :) .*= ((x-x0(i))/(x0(j)-x0(i)));
  endfor
endfor
for k = 1:1:d                                  # k 從1開始，每次增加1，最高不超過d
  subplot(4, 3, k)                             #生成 6*2 格子的圖像，目前使用第 k 個格子
  plot(x, y(k, :))                             #繪圖，x為 x 軸，y為 y 軸
  set(gca,'FontSize',10);
  xlabel("X",'FontSize',15);
  ylabel("Lj(x)",'FontSize',15);
  title(x0(k),'FontSize',15);
  grid on;
end
```

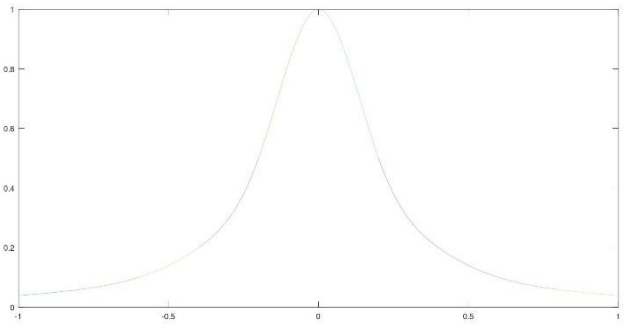
A2 code

```
filename = "hw1AB.dat";
[datax,datay] = textread(filename, "%f %f",'headerlines',1);
x0 = datax;
y0 = datay;
x = linspace(-1,1,5000)


function[y] = lagrange(x, x0, y0)
a = size(x0, 1)
y=0;
for j = 1:a
  p = 1;
  for i = 1:a
    if j  == i
      continue;
    endif
    p.*=(x-x0(i))/(x0(j)-x0(i));
  endfor
  y += y0(j)*p;
endfor
endfunction
y = lagrange(x,x0,y0);

figure
plot(x,y)

```

B1

```
  0.4422
  1.4724
  2.4882
 18.5748
-46.7874
 18.5748
  2.4882
  1.4724
  0.4422
       0
```

B2



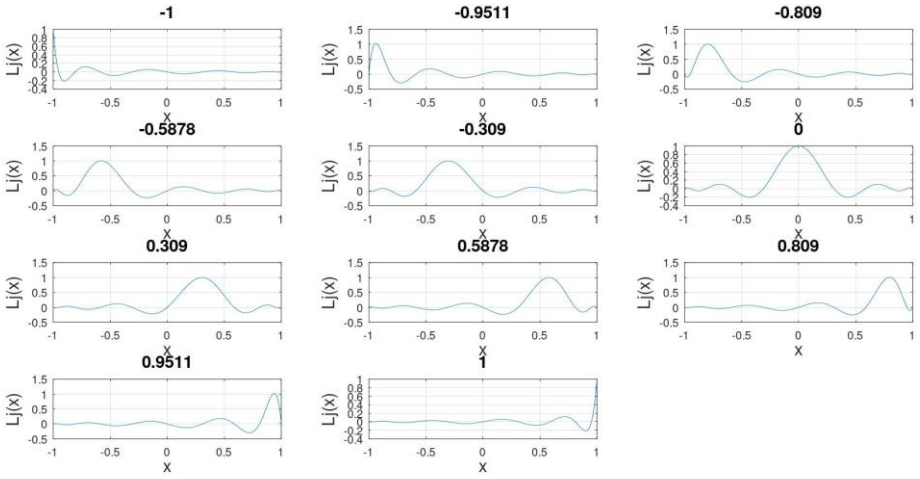
B1 code

```
filename = "hw1AB.dat";
[datax, datay] = textread(filename,"%f %f",'headerlines',1);
x0 = datax;
y0 = datay;
n = size(x0,1)                              # n 為 x0 的行數
matrix = zeros(n, n);                       # matrix 為nxn的零矩陣
f = zeros(n, 1);
delta = zeros(n, 1);
gsd = zeros(n, 1);                          #f'delta'gsd皆為1xn的零矩陣

delta = diff(x0)                            #x矩陣相鄰兩數之差

for k = 2:n-1
  for j =1:n
    if k ==j+1
      matrix(k,j) = delta(j, 1)./6
    elseif k ==j
      matrix(k,j) = (delta(j, 1).+delta(j-1,1))./3;
    elseif k == j-1
      matrix(k, j) = delta(j-1, 1)./6;
    endif
  endfor
endfor                                      #利用loop迴圈來跑矩陣內數值

for q = 1+1:n-1
  f(q,1) = (y0(q+1).-y0(q))./delta(q, 1).-(y0(q).-y0(q-1))./delta(q, 1)
endfor

gsd = matrix\f;
gsd(1,1)=0;
gsd(n,1)=0;
disp(f)
disp(matrix)
disp(gsd)
```

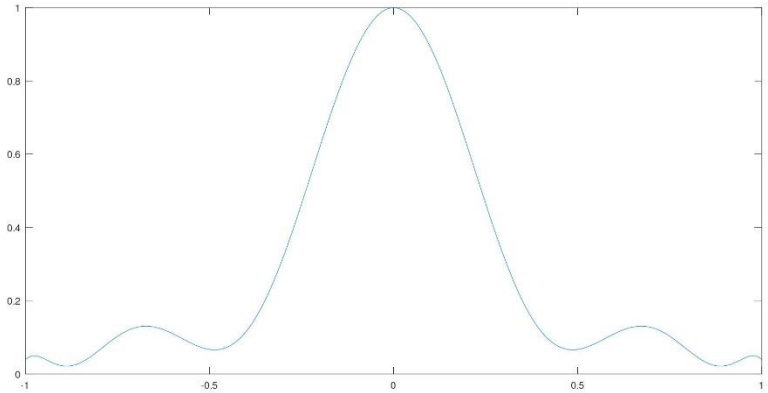
B2 code

```
filename = 'hw1AB.dat'
[xj,yj]=textread(filename,'%f %f','HeaderLines',1)

d = length(x0); #x0的行數
delta = zeros(1,d);
g=zeros(d,d);
g(1,1)=1;
g(d,d)=1;
f=zeros(d,1)
f(1,1)=0
f(d,1)=0

for i=1:(d-1)
  delta(1,i)=x0(i+1)-x0(i);
endfor

for j=2:d-1
 for k=1:d
    if k==j-1
       g(j,k)=delta(j-1)./6;
    endif
    if k==j
       g(j,k)=(delta(j)+delta(j-1))./3;
    endif
    if k==j+1
       g(j,k)=delta(j)./6;
    endif
 endfor
endfor

for l=2:d-1
  f(l,1)=((y0(l+1)-y0(l))./delta(l))-((y0(l)-y0(l-1))./delta(l-1));
endfor

s=g\f
t=s'

q=ones(10,2001)
for m=1:10
x=x0(m):0.0001:x0(m+1)
q(m,:)=q(m,:).*((t(m)/6)*((((x0(m+1)-x).^3)/delta(m))-(delta(m)*(x0(m+1)-x)))+((t(m+1)/6)*((((x-x0(m)).^3)/delta(m))-(delta(m)*(x-x0(m)))))+y0(m)*((x0(m+1)-x)/delta(m))+y0(m+1)*((x-x0(m))/delta(m));
plot(x,q(m,:))
hold on;
endfor;
```

C1



C2



C1 code

```
filename = "hw1CD.dat";
[datax, datay] = textread(filename, "%f %f",'headerlines',1);
x0 = datax;
y0 = datay;
x = linspace(-1,1,500)
y = zeros(d, 500);
y=y+1;

for j = 1:d
  for i = 1:d
    if j == i
      continue;
          #skip and continue the loop
    endif
    y(j, :) .*= ((x-x0(i))/(x0(j)-x0(i)));
  endfor
 endfor

for k = 1:1:d
  subplot(4,3,k)
  plot(x,y(k,:))

  set(gca,'FontSize',10)
  xlabel("x",'FontSize',15);
  ylabel("Lj(x)",'FontSize',15);
  title(x0(k),'FontSize',15);
  grid on;

end
```

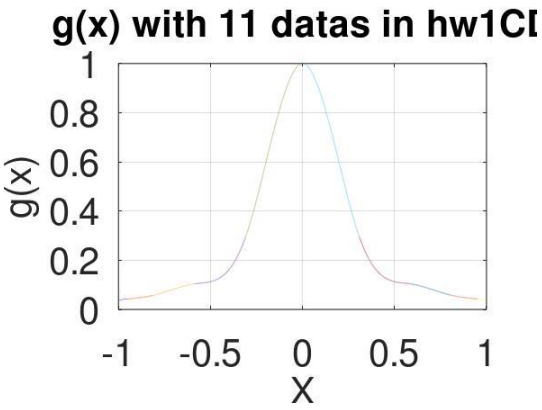
C2 code

```
filename = "hw1CD.dat";
[datax, datay] = textread(filename,"%f %f",'headerlines',1);
x0 = datax;
y0 = datay;
x = linspace(-1, 1, 500)

function [y] = lagrange(x, x0, y0)
  n = size(x0, 1);
  y=0;
  for  j = 1:n
    p=1;
    for i = 1:n
      if j == i
        continue;
      endif
      p.*=(x-x0(i))/(x0(j)-x0(i));
    endfor
    y += y0(j)*p;

  endfor
endfunction
y = lagrange(x, x0, y0);



figure
plot(x, y)
```

D1

```
       0
 -0.1172
  1.5061
 -2.1080
 16.6456
-30.4675
 16.6456
 -2.1080
  1.5061
 -0.1172
       0
```

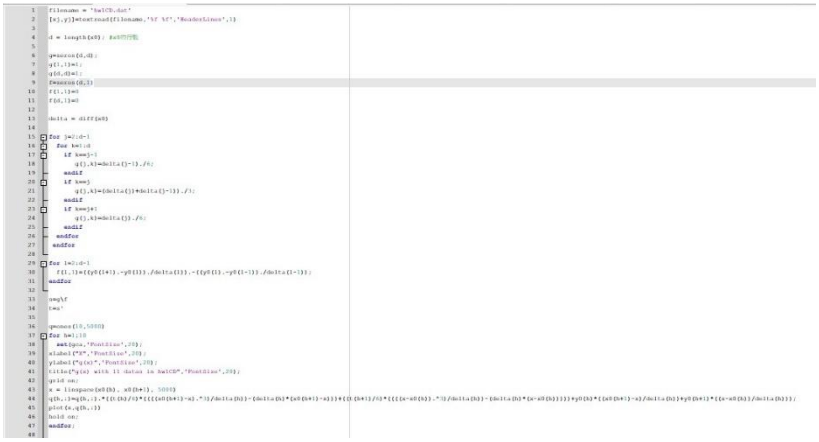
D2



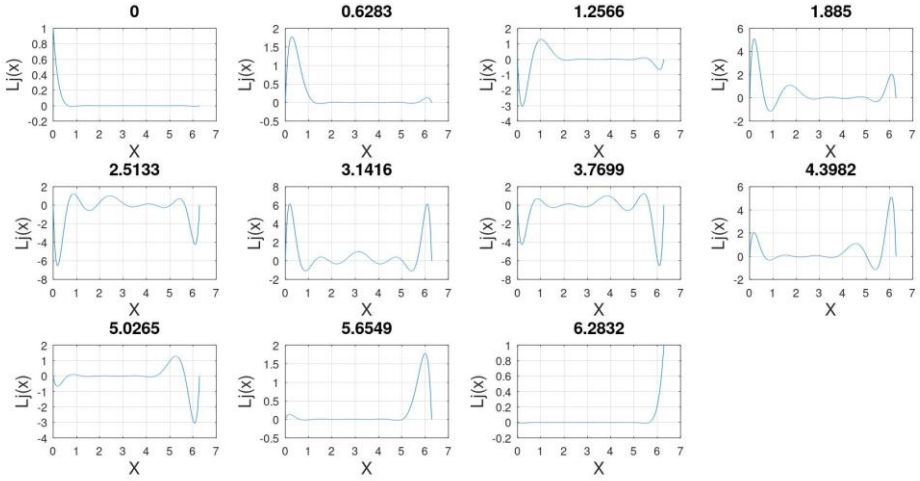
D1 code

```
filename = "hw1CD.dat";
[datax,datay] = textread(filename, "%f %f", 'headerlines', 1);

x0 = datax;
y0 = datay;
n = size(x0, 1)
matrix = zeros (n, n);
f = zeros (n, 1);

gsd = zeros(n, 1);

delta = diff(x0);

for k = 1+1:n-1
  for j = 1:n
    if k == j+1
      matrix(k, j) = delta(j, 1)./6
    elseif k == j
      matrix(k, j) = (delta(j, 1) +delta (j-1, 1))./3;
    elseif k ==j-1
      matrix(k, j) = delta(j-1, 1)./6;
    endif
  endfor
endfor

for q = 1+1:n-1
  f(q, 1) = (y0(q+1)-y0(q))./delta(q, 1)-(y0(q)-y0(q-1))./delta(q-1, 1)
endfor

gsd = matrix\f; ########
gsd(1, 1) = 0;
gsd(n, 1) = 0;

disp(gsd)
```

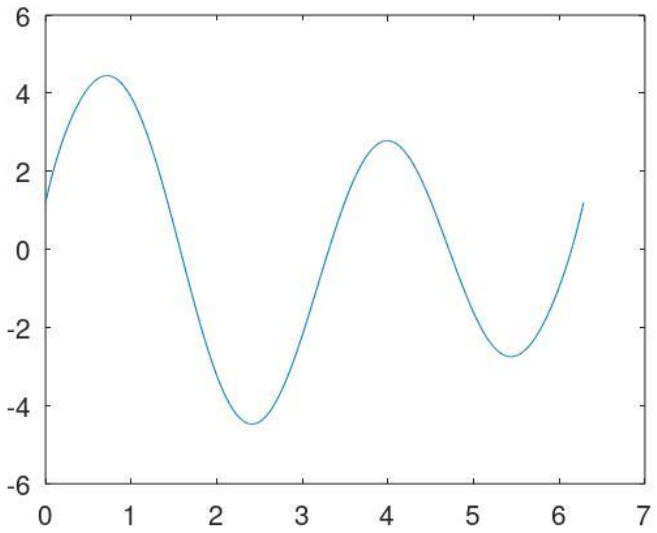
D2 code



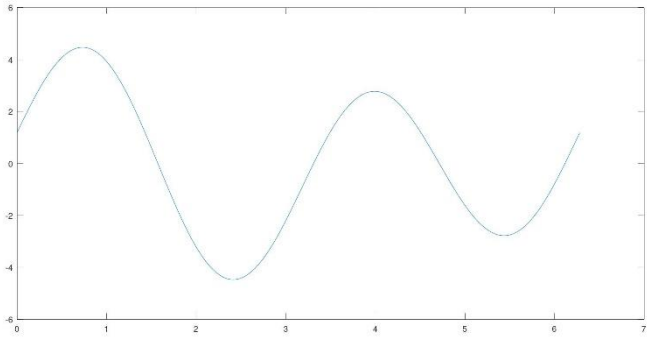
E1


0
0.6283
1.2566
1.885
2.5133
3.1416
3.7699
4.3982
5.0265
5.6549
6.2832
Lj(x)
X

E2



E3



E1 code

```
filename = "hw1E.dat";
[datax, datay] = textread(filename,"%f %f","headerlines",1);
    #read data from a text file
    #The file filename is read and parsed according to format.
    #"headerlines": The first value number of lines of filename are skipped.
x0 = datax;
y0 = datay;
x = linspace(0, 2*pi, 500)

d = size(x0, 1);
    #Return a row vector with the size (number of elements) of each dimension for the object x0.
    #When given a second argument, dim, return the size of the corresponding dimension.\
    # d 代表 x0 的行數
y = zeros(d, 500);
y = y+1;

for j = 1:d
  for i = 1:d
    if j == i
      continue;
          #skip and continue the loop
    endif
    y(j, :) .*= ((x-x0(i))/(x0(j)-x0(i)));
  endfor
 endfor
for k = 1:1:d
  # k 從1開始，每次增加1，最高不超過d
  subplot(3, 4, k)
  #生成 3*4 格子的圖像，目前使用第 k 個格子
  plot(x, y(k, :))
  #繪圖，x為 x 軸，y為 y 軸
  set(gca,'FontSize',10);
  xlabel("X",'FontSize',15);
  ylabel("Lj(x)",'FontSize',15);
  title(x0(k),'FontSize',15);
  grid on;
end
```

E2 code

```
filename = "hw1E.dat";
[datax,datay] = textread(filename, "%f %f",'headerlines',1);
x0 = datax;
y0 = datay;
x = linspace(0,2*pi,500)


function[y] = lagrange(x, x0, y0)
n = size(x0, 1)
y=0;
for j = 1:n
  p = 1;
  for i = 1:n
    if j  == i
      continue;
    endif
    p.*=(x-x0(i))/(x0(j)-x0(i));
  endfor
  y += y0(j)*p;
endfor
endfunction
y = lagrange(x,x0,y0);

figure
plot(x,y)
```

E3 code

```
filename = "hw1E.dat";
[datax,datay] = textread(filename, "%f %f",'headerlines',1);
x0 = datax;
y0 = datay;
n = size(x0,1)




 for i = 1:n
    z0(i, 1) = 3.6 *sin(2*x0(i));
 endfor

for i = 1:n
    q0(i, 1) = cos(x0(i));
endfor

disp(q0)
disp(z0)

p0 = y0 .- z0

a = p0./q0

w1=linspace(0,6.28,500)
w2 = 1.2*cos(w1)+3.6*sin(2*w1)

figure
plot(w1,w2)
```

手寫稿