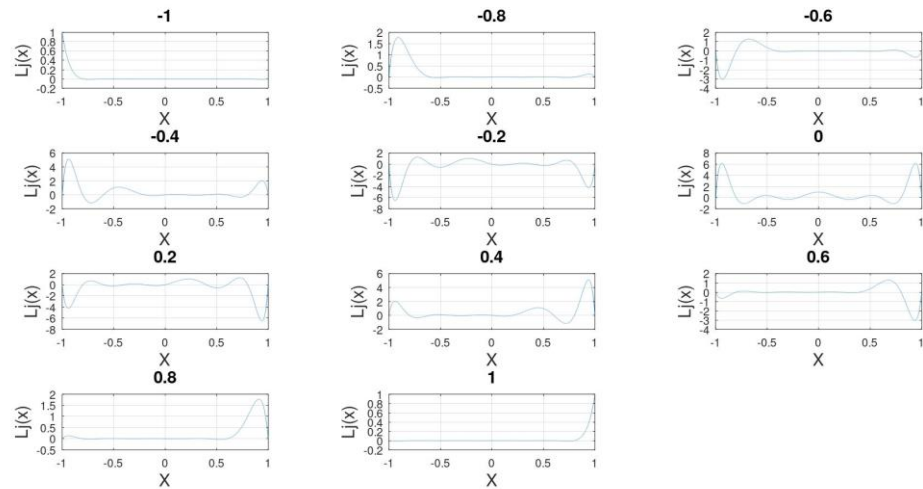
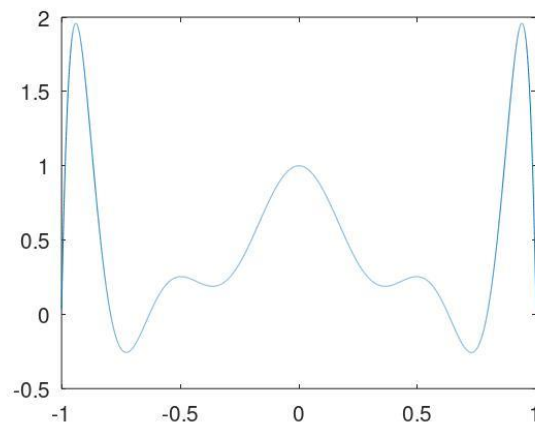


A1



A2



A1 code

```

1 filename = "hw1AB.dat";
2 [datax, datay] = textread(filename,"%f %f","headerlines",1);
3 #read data from a text file
4 #The file filename is read and parsed according to format.
5 # "headerlines": The first value number of lines of filename are skipped.
6 x0 = datax;
7 y0 = datay;
8 x = linspace(-1, 1, 5000)
9 #從-1至1分割出5000個數字
10 d = size(x0, 1);
11 #Return a row vector with the size (number of elements) of each dimension for the object x0.
12 #When given a second argument, dim, return the size of the corresponding dimension.\
13 # d 代表 x0 的行數
14 y = zeros(d, 5000);
15 y = y+1;
16
17 for j = 1:d
18     for i = 1:d
19         if j == i
20             continue;
21             #skip and continue the loop
22         endif
23         y(j, :) .*= ((x-x0(i))/(x0(j)-x0(i)));
24     endfor
25 endfor
26 for k = 1:1:d
27     subplot(4, 3, k)
28     plot(x, y(k, :))
29     set(gca,'FontSize',10);
30     xlabel("X",'FontSize',15);
31     ylabel("Lj(x)", 'FontSize',15);
32     title(x0(k), 'FontSize',15);
33     grid on;
34 end

```

A2 code

```

1 filename = "hw1AB.dat";
2 [datax, datay] = textread(filename, "%f %f", 'headerlines', 1);
3 x0 = datax;
4 y0 = datay;
5 x = linspace(-1, 1, 5000);
6
7
8 function[y] = lagrange(x, x0, y0)
9     a = size(x0, 1);
10    y=0;
11    for j = 1:a
12        p = 1;
13        for i = 1:a
14            if j == i
15                continue;
16            endif
17            p.*(x-x0(i))/(x0(j)-x0(i));
18        endfor
19        y += y0(j)*p;
20    endfor
21 endfunction
22 y = lagrange(x, x0, y0);
23
24 figure
25 plot(x, y)
26

```

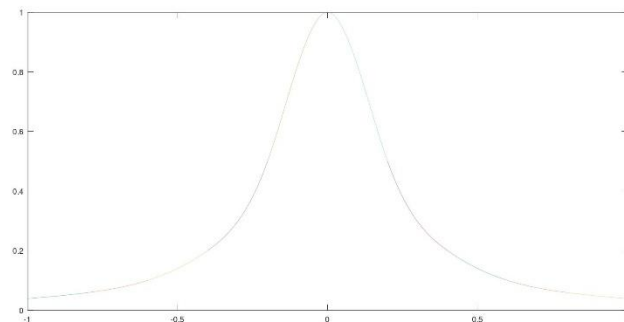
B1

```

0.4422
1.4724
2.4882
18.5748
-46.7874
18.5748
2.4882
1.4724
0.4422
0

```

B2



B1 code

```

1 filename = "hw1AB.dat";
2 [datax, datay] = textread(filename, "%f %f", 'headerlines', 1);
3 x0 = datax;
4 y0 = datay;
5 n = size(x0, 1); % n 為 x0 的行數
6 matrix = zeros(n, n); % matrix 為 nxn 的零矩陣
7 f = zeros(n, 1);
8 delta = zeros(n, 1); % f, delta, gsd 皆為 1xn 的零矩陣
9 gsd = zeros(n, 1); % x 矩陣相鄰兩數之差
10
11 delta = diff(x0);
12
13 for k = 2:n-1
14     for j = 1:n
15         if k == j+1
16             matrix(k, j) = delta(j, 1) ./ 6;
17         elseif k == j
18             matrix(k, j) = (delta(j, 1) + delta(j-1, 1)) ./ 3;
19         elseif k == j-1
20             matrix(k, j) = delta(j-1, 1) ./ 6;
21         endif
22     endfor
23 endfor %利用loop迴圈來跑矩陣內數值
24
25 for q = 1+1:n-1
26     f(q, 1) = (y0(q+1) - y0(q)) ./ delta(q, 1) - (y0(q) - y0(q-1)) ./ delta(q, 1);
27 endfor
28
29 gsd = matrix \ f;
30 gsd(1, 1) = 0;
31 gsd(n, 1) = 0;
32 disp(f);
33 disp(matrix);
34 disp(gsd);
35

```

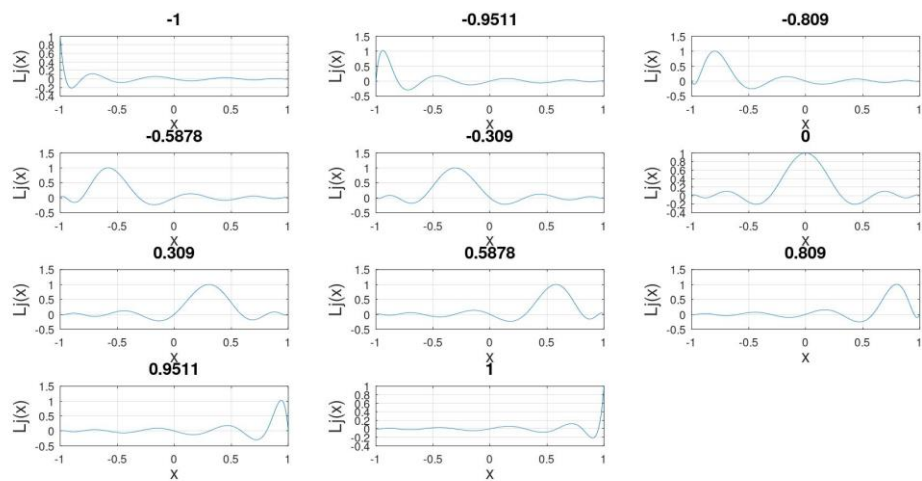
B2 code

```

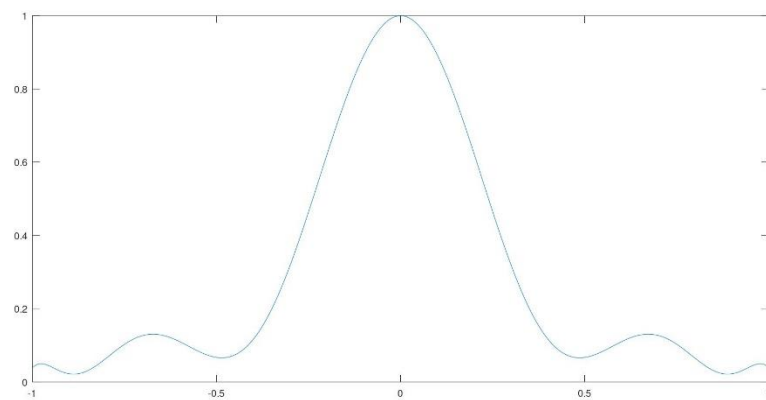
1 filename = 'hviAB.dat'
2 [x,y]=textread(filename,'%f %f','HeaderLines',1)
3
4 d = length(x0); %x0的行数
5 delta = zeros(1,d);
6 g=zeros(d,d);
7 g(1,1)=1;
8 g(d,d)=1;
9 f=zeros(d,1)
10 f(1,1)=0
11 f(d,1)=0
12
13 for i=1:(d-1)
14     delta(1,i)=a0(i+1)-x0(i);
15 endfor
16
17 for j=2:d-1
18     for k=1:d
19         if k==j-1
20             g(j,k)=delta(j-1)/E;
21         elseif k==j
22             g(j,k)=(delta(j)+delta(j-1))/2;
23         elseif k==j+1
24             g(j,k)=delta(j)/E;
25         end
26     end
27 endfor
28
29 for l=0:d-1
30     f(1,l)=(y0(l+1)-y0(l))/delta(l)-((y0(l)-y0(l-1))/delta(l-1));
31 endfor
32
33 smg='f
34 tma'
35 q=zeros(10,2001)
36 for m=1:10
37     xma0(m)=0.0001*x0(m+1)
38     q(m,:)=mg(m,:).*(t(m)/G*(((x0(m+1)-x).^2)/delta(m))-(delta(m)*(x0(m+1)-x))+((t(m+1)/G)*(((x-x0(m)).^2)/delta(m))-(delta(m)*(x-x0(m)))))+y0(m)*(x0(m+1)-x)/delta(m)+y0(m+1)*((x-x0(m))/delta(m));
39     plot(x,q(m,:))
40     hold on
41 endfor

```

C1



C2



C1 code

```
1 filename = "hw1CD.dat";
2 [datax, datay] = textread(filename, "%f %f", 'headerlines', 1);
3 x0 = datax;
4 y0 = datay;
5 x = linspace(-1, 1, 500);
6 y = zeros(d, 500);
7 y=y+1;
8
9 for j = 1:d
10     for i = 1:d
11         if j == i
12             continue;
13             #skip and continue the loop
14         endif
15         y(j, :) .*= ((x-x0(i))/(x0(j)-x0(i)));
16     endfor
17 endfor
18
19 for k = 1:1:d
20     subplot(4,3,k)
21     plot(x,y(k,:))
22
23     set(gca, 'FontSize', 10)
24     xlabel("x", 'FontSize', 15);
25     ylabel("Lj(x)", 'FontSize', 15);
26     title(x0(k), 'FontSize', 15);
27     grid on;
28
29 end
30
```

C2 code

```
1 filename = "hw1CD.dat";
2 [datax, datay] = textread(filename, "%f %f", 'headerlines', 1);
3 x0 = datax;
4 y0 = datay;
5 x = linspace(-1, 1, 500);
6
7 function [y] = lagrange(x, x0, y0)
8     n = size(x0, 1);
9     y=0;
10    for j = 1:n
11        p=1;
12        for i = 1:n
13            if j == i
14                continue;
15            endif
16            p.=(x-x0(i))/(x0(j)-x0(i));
17        endfor
18        y += y0(j)*p;
19
20    endfor
21 endfunction
22 y = lagrange(x, x0, y0);
23
24
25
26 figure
27 plot(x, y)
28
```

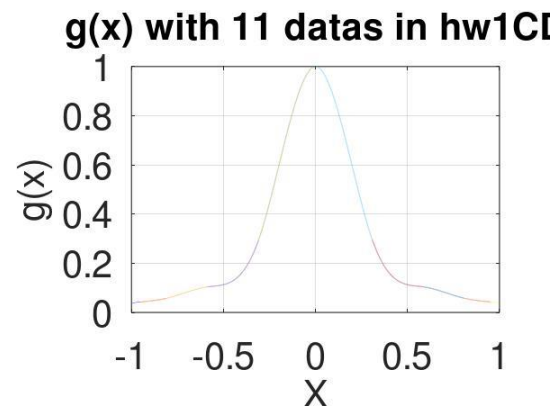
D1

D2

```

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

```



D1 code

```

1 filename = "hw1CD.dat";
2 [datax, datay] = textread(filename, "%f %f", 'headerlines', 1);
3
4 x0 = datax;
5 y0 = datay;
6 n = size(x0, 1);
7 matrix = zeros(n, n);
8 f = zeros(n, 1);
9
10 gsd = zeros(n, 1);
11
12 delta = diff(x0);
13
14 for k = 1:n-1
15     for j = 1:n
16         if k == j+1
17             matrix(k, j) = delta(j, 1)/6;
18         elseif k == j
19             matrix(k, j) = (delta(j, 1) + delta(j-1, 1))/3;
20         elseif k == j-1
21             matrix(k, j) = delta(j-1, 1)/6;
22         endif
23     endfor
24 endfor
25
26 for q = 1:n-1
27     f(q, 1) = (y0(q+1) - y0(q)) / delta(q, 1) - (y0(q) - y0(q-1)) / delta(q-1, 1);
28 endfor
29
30 gsd = matrix \ f; #####
31 gsd(1, 1) = 0;
32 gsd(n, 1) = 0;
33
34 disp(gsd)

```

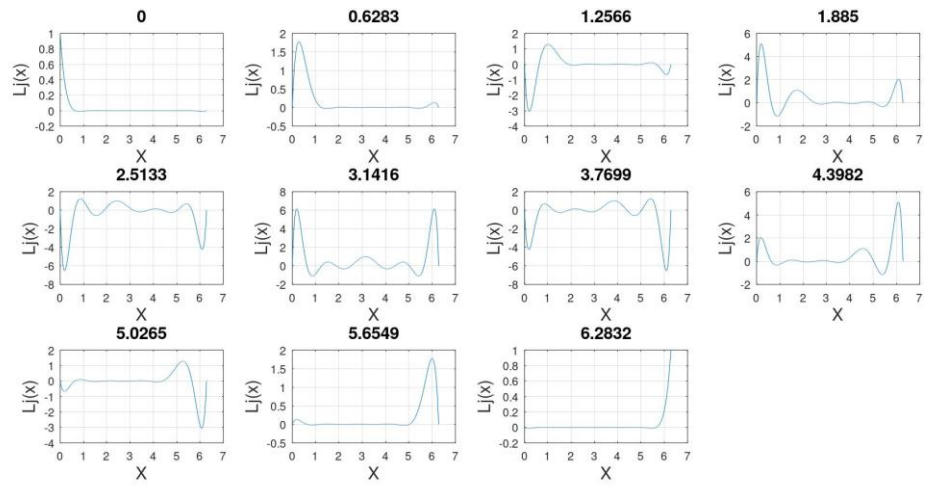
D2 code

```

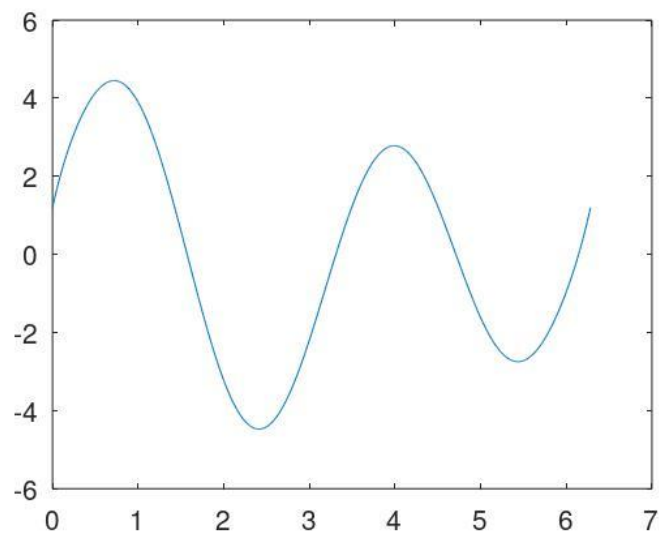
1 filename = "hw1CD.dat";
2 [x, y] = textread(filename, "%f %f", 'headerlines', 1);
3
4 n = length(x); % number of data points
5
6 % Create the matrix A and the vector f
7 A = zeros(n, n);
8 f = zeros(n, 1);
9
10 % Loop over the data points to calculate the matrix A and the vector f
11 for i = 1:n-1
12     delta = diff(x(i+1:n));
13
14     for j = i+1:n
15         A(i, j) = (delta(j-i) - delta(j-i-1)) / 6;
16     end
17
18     for j = i-1:i
19         A(i, j) = (delta(j-i+1) + delta(j-i)) / 3;
20     end
21
22     for j = i-2:i-1
23         A(i, j) = delta(j-i+1) / 6;
24     end
25
26     f(i) = (y(i+1) - y(i)) / delta(i) - (y(i) - y(i-1)) / delta(i-1);
27 end
28
29 % Solve the system A \ f = gsd
30 gsd = A \ f;
31
32 % Plot the function g(x)
33 figure;
34 hold on;
35 plot(x, y, 'o');
36 plot(x, gsd, 'b');
37
38 % Add a legend
39 legend('Data points', 'g(x)');
40
41 % Title the plot
42 title('g(x) with 11 datas in hw1CI');
43
44 % Axis labels
45 xlabel('x');
46 ylabel('g(x)');
47
48 % Grid on
49 grid on;

```

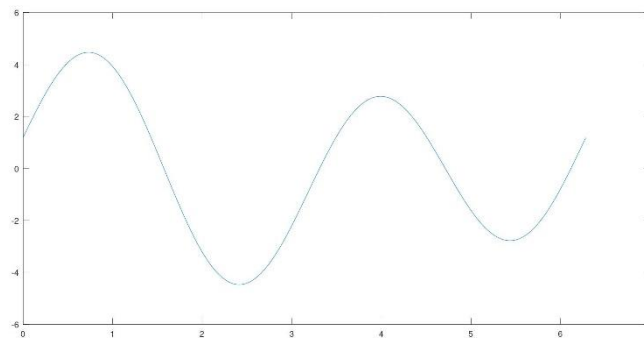
E1



E2



E3



E1 code

```

1 filename = "hw1E.dat";
2 [datax, datay] = textread(filename, "%f %f", "headerlines", 1);
3     #read data from a text file
4     #The file filename is read and parsed according to format.
5     #"headerlines": The first value number of lines of filename are skipped.
6 x0 = datax;
7 y0 = datay;
8 x = linspace(0, 2*pi, 500)
9
10 d = size(x0, 1);
11     #Return a row vector with the size (number of elements) of each dimension for the object x0.
12     #When given a second argument, dim, return the size of the corresponding dimension.\
13     # d 代表 x0 的行數
14 y = zeros(d, 500);
15 y = y+1;
16
17 for j = 1:d
18     for i = 1:d
19         if j == i
20             continue;
21             #skip and continue the loop
22         endif
23         y(j, :) .*= ((x-x0(i))/(x0(j)-x0(i)));
24     endfor
25 endfor
26 for k = 1:1:d
27     # k 從1開始，每次增加1，最高不超過d
28     subplot(3, 4, k)
29     #生成 3*4 格子的圖像，目前使用第 k 個格子
30     plot(x, y(k, :))
31     #繪圖，x為 x 軸，y為 y 軸
32     set(gca, 'FontSize', 10);
33     xlabel("X", 'FontSize', 15);
34     ylabel("Lj(x)", 'FontSize', 15);
35     title(x0(k), 'FontSize', 15);
36     grid on;
37 end

```

E2 code

```

1 filename = "hw1E.dat";
2 [datax, datay] = textread(filename, "%f %f", 'headerlines', 1);
3 x0 = datax;
4 y0 = datay;
5 x = linspace(0, 2*pi, 500)
6
7
8 function[y] = lagrange(x, x0, y0)
9     n = size(x0, 1)
10     y=0;
11     for j = 1:n
12         p = 1;
13         for i = 1:n
14             if j == i
15                 continue;
16             endif
17             p .*= (x-x0(i))/(x0(j)-x0(i));
18         endfor
19         y += y0(j)*p;
20     endfor
21 endfunction
22 y = lagrange(x, x0, y0);
23
24 figure
25 plot(x, y)

```


E3 code

```

1 filename = "hw1E.dat";
2 [datax,datay] = textread(filename, "%f %f", 'headerlines',1);
3 x0 = datax;
4 y0 = datay;
5 n = size(x0,1)
6
7
8
9
10 for i = 1:n
11     z0(i, 1) = 3.6 *sin(2*x0(i));
12 endfor
13
14 for i = 1:n
15     q0(i, 1) = cos(x0(i));
16 endfor
17
18 disp(q0)
19 disp(z0)
20
21 p0 = y0 .- z0
22
23 a = p0./q0
24
25 w1= linspace(0,6.28,500)
26 w2 = 1.2*cos(w1)+3.6*sin(2*w1)
27
28 figure
29 plot(w1,w2)

```

手寫稿

