```
%%Homework
%STUID 15307130224
%GuoZhen She
%The answer is shown in paper attached in the same directory


%%Code For Question1
clear all
sigma = 1.5;


area_x =
 [10+5*rand(100,1),20+5*rand(100,1),30+5*rand(100,1),40+5*rand(100,1)];
area_y =
 [10*rand(100,1),10*rand(100,1),10*rand(100,1),10*rand(100,1)];

figure(1)
plot(area_x, area_y, '.')
hold on

W=zeros(400,400);

for i = 1:400
 for j = 1:400
  W(i,j) = exp((-((area_x(i)-area_x(j))^2+(area_y(i)-
area_y(j))^2)^0.5)/(2*sigma*sigma));
 end
end

D = zeros(400,400);
for i = 1:400
 D(i,i) = sum(W(i,:));
end

L = D - W;

L_sys = D^(-0.5)*L*D^(-0.5);
L_rw = D^(-1);


[V_tras,S,V] = eig(L_sys);

value1 = S(400,400)
value2 = S(399,399)
value3 = S(398,398)
value4 = S(397,397)


U = V(:,1:4);

H = D^(-0.5)*U;
```

```
figure(2)
subplot(2,2,1);plot(H(:,1),'.');
subplot(2,2,2);plot(H(:,2),'.');
subplot(2,2,3);plot(H(:,3),'.');
subplot(2,2,4);plot(H(:,4),'.');
hold on


%%Code For Question2
clear all
sigma = 1.5;

area_x =
 [10+5*rand(100,1),20+5*rand(100,1),30+5*rand(100,1),40+5*rand(100,1)];
area_y =
 [10*rand(100,1),10*rand(100,1),10*rand(100,1),10*rand(100,1)];


W=zeros(400,400);

for i = 1:400
 for j = 1:400
  %%Judge whether two points are in the same area
  if (i>0 && i<101 && j>0 && j<101) || (i>100 && i<201 && j>100 &&
 j<201) ||(i>200 && i<301 && j>200 && j<301)||(i>300 && i<401 && j>300
 && j<401)
   W(i,j) = exp((-((area_x(i)-area_x(j))^2+(area_y(i)-
area_y(j))^2)^0.5)/(2*sigma*sigma));
  end
 end
end

D = zeros(400,400);
for i = 1:400
 D(i,i) = sum(W(i,:));
end

L = D - W;

L_sys = D^(-0.5)*L*D^(-0.5);
L_rw = D^(-1);


[V,S] = eig(L_sys);
[k, index] = sort(sum(S,1));


U = V(:,index(1:4));

H = D^(-0.5)*U;

figure(3)
subplot(2,2,1);plot(H(:,1),'.')
subplot(2,2,2);plot(H(:,2),'.')
```

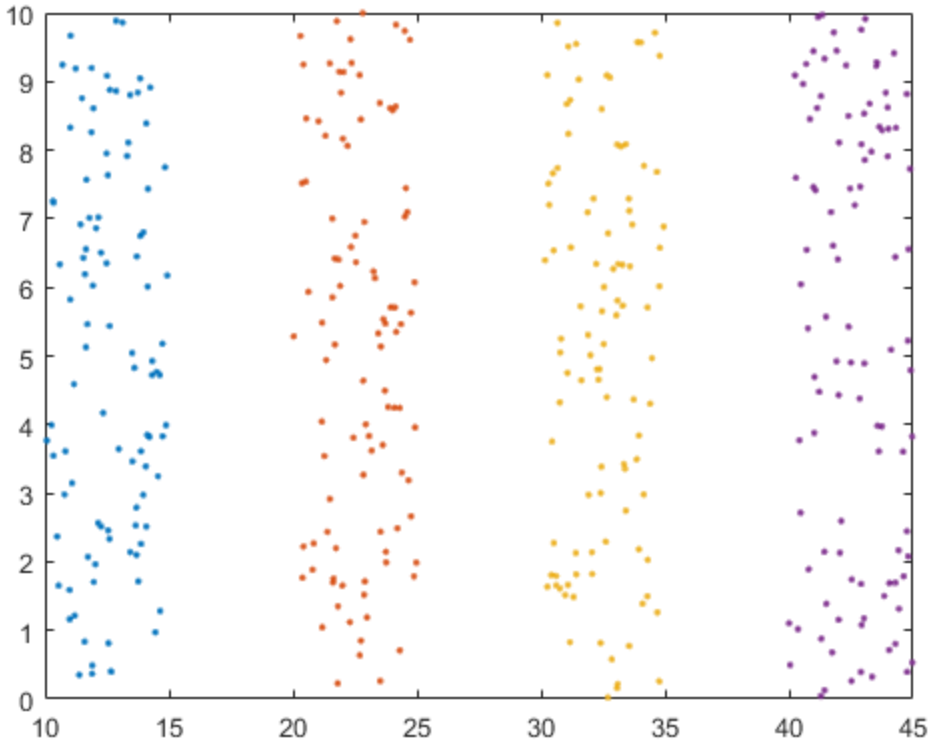
```
subplot(2,2,3);plot(H(:,3),'.')
subplot(2,2,4);plot(H(:,4),'.')
hold on
```

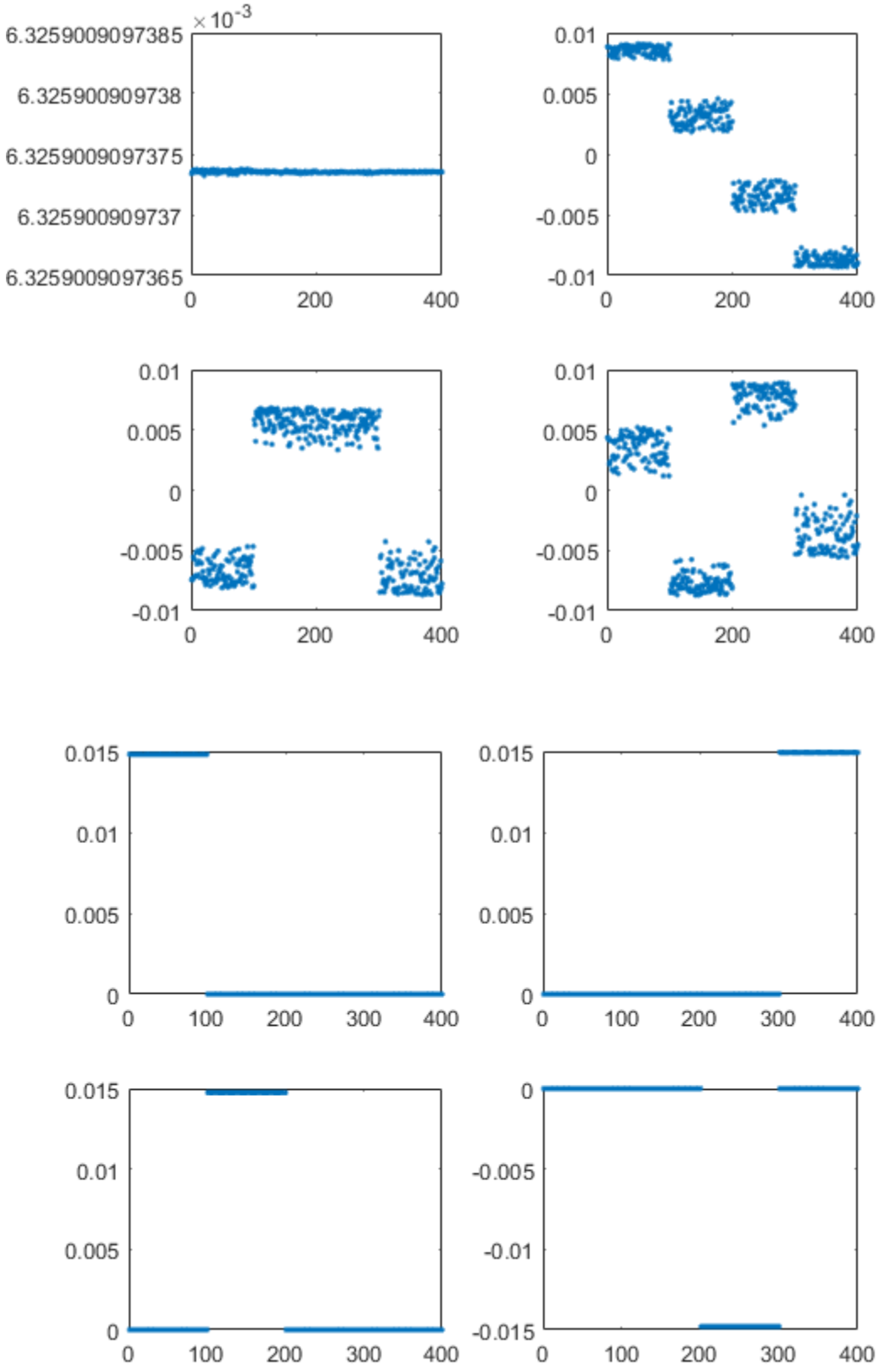
```
value1 =

    0.9990
```

```
value2 =

    0.9987
```

```
value3 =

    0.9987
```

```
value4 =

    0.9987
```




×10^-3
6.3259009097385
6.325900909738
6.3259009097375
6.325900909737
6.3259009097365
0.01
0.005
0
-0.005
-0.01
0.015
0
100
200
300
400

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