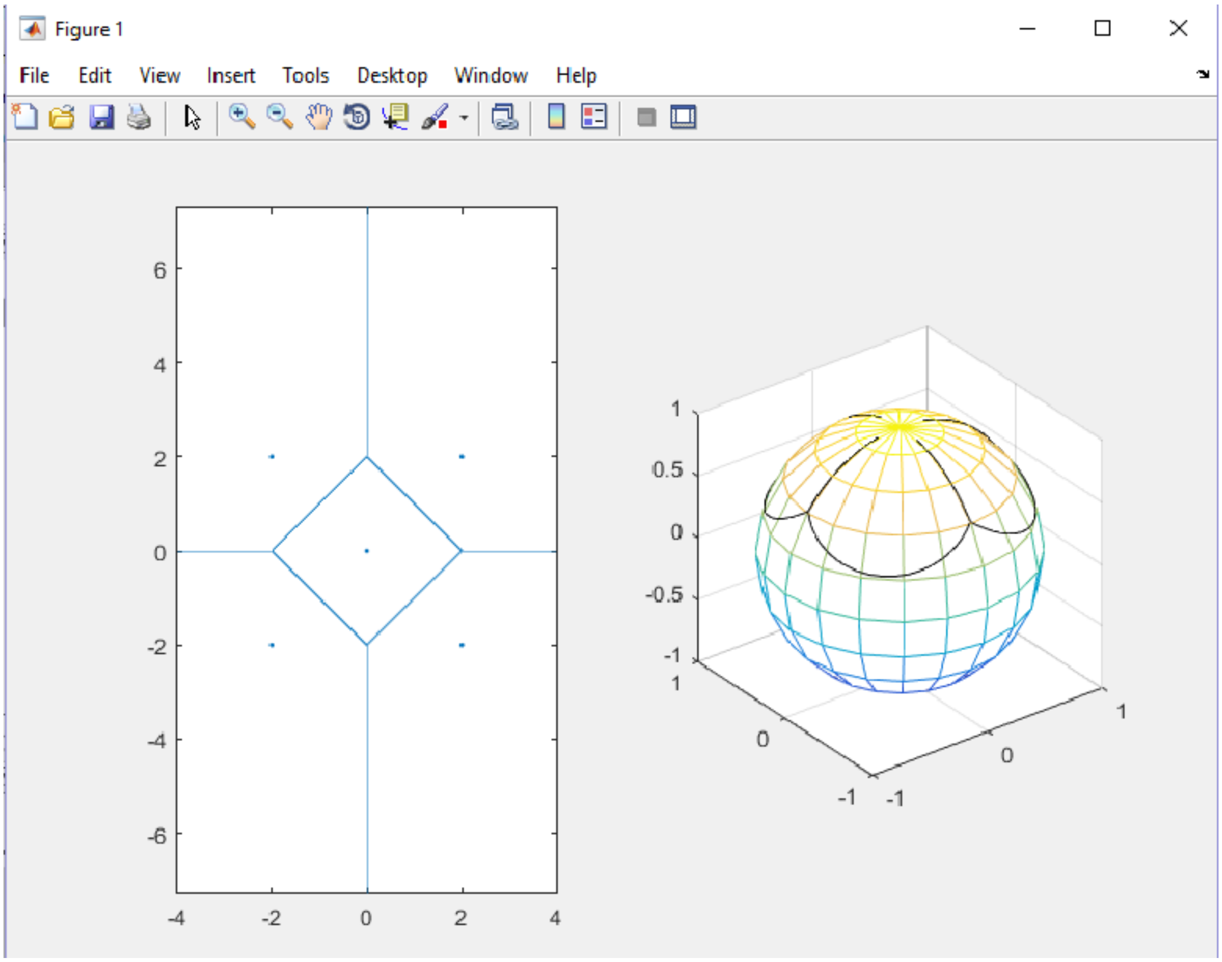
Ex. 1) Given $P_1, \ldots, P_n$ a set of points on a 2-Sphere, let $Q_1, \ldots, Q_n$ be their projections on the two planes. Construct the Voronoi diagram of $Q = \{ Q_1, \ldots, Q_n \}$. Map this picture, Vor(Q), back to the sphere.

```
clear all
a=-pi/2:pi/10:pi/2;
b=0:pi/10:2*pi;
for i=1:length(a)
    for j=1:length(b)
        x(i,j)=cos(a(i))*cos(b(j));
        y(i,j)=cos(a(i))*sin(b(j));
        z(i,j)=sin(a(i))+0*j;
    end
end
subplot(1,2,2)
mesh(x,y,z)
hold on
axis equal

qx1=-2; qy1=-2;
qx2=2; qy2=-2;
qx3=2; qy3=2;
qx4=0; qy14=0;
qx5=-2; qy15=2;

t=-10:0.1:-2;
u=t;
v=0*t;
N=1+u.^2+v.^2;
xx=2*u./N;
yy=2*v./N;
zz=(N-2)./N;
plot3(xx,yy,zz,'k')

t=-2:0.1:0;
u=t;
v=-2-t;
N=1+u.^2+v.^2;
xx=2*u./N;
yy=2*v./N;
zz=(N-2)./N;
plot3(xx,yy,zz,'k')

t=-10:0.1:-2;
u=0*t;
v=t;
N=1+u.^2+v.^2;
xx=2*u./N;
yy=2*v./N;
zz=(N-2)./N;
plot3(xx,yy,zz,'k')

t=0:0.1:2;
u=t;
v=-2+t;
N=1+u.^2+v.^2;
xx=2*u./N;
```

```
yy=2*v./N;
zz=(N-2)./N;
plot3(xx,yy,zz,'k')

t=2:0.1:10;
u=t;
v=0*t;
N=1+u.^2+v.^2;
xx=2*u./N;
yy=2*v./N;
zz=(N-2)./N;
plot3(xx,yy,zz,'k')

t=0:0.1:2;
u=t;
v=2-t;
N=1+u.^2+v.^2;
xx=2*u./N;
yy=2*v./N;
zz=(N-2)./N;
plot3(xx,yy,zz,'k')

t=2:0.1:10;
u=0*t;
v=t;
N=1+u.^2+v.^2;
xx=2*u./N;
yy=2*v./N;
zz=(N-2)./N;
plot3(xx,yy,zz,'k')

t=-2:0.1:0;
u=t;
v=2+t;
N=1+u.^2+v.^2;
xx=2*u./N;
yy=2*v./N;
zz=(N-2)./N;
plot3(xx,yy,zz,'k')

subplot(1,2,1)
u=[-2 2 2 0 -2];
v=[-2 -2 2 0 2];
voronoi(u,v)
xlim([-4 4])
ylim([-4 4])
axis equal
%adaugam
U=[u(:) v(:)]
[V C]=voronoin(U)
```



Ex. 2) Given $P_0(0, 4)$, $P_1(0, 0)$, $P_2(6, 0)$ and $P_3(6, 4)$ write the expression on the Bezier cubic obtained from the control polygon P_0 P_1 P_2 P_3 and prove that is a PH-curve.

3) The same request for $P_0(0, 1)$, $P_1(0, 0)$, $P_2(1, 0)$ and $P_3(0, -1)$.

```
clear all
syms t

x0=0;y0=4;
x1=0;y1=0;
x2=6;y2=0;
x3=6;y3=9;
b0=(1-t)^3;
b1=3*t*(1-t)*(1-t);
b2=3*t*t*(1-t);
b3=t^3;
x=simplify(x0*b0+x1*b1+x2*b2+x3*b3)
y=simplify(y0*b0+y1*b1+y2*b2+y3*b3)

xp=diff(x,t)
yp=diff(y,t)
```

```
s=simplify(xp^2+yp^2);
factor(s)
```

```
x =

-6*t^2*(2*t - 3)


y =

9*t^3 - 4*(t - 1)^3


xp =

- 12*t*(2*t - 3) - 12*t^2


yp =

27*t^2 - 12*(t - 1)^2


ans =

[ 9, 13*t^2 - 8*t + 4, 13*t^2 - 8*t + 4]
```

```
clear all
syms t

x0=0;y0=1;
x1=0;y1=0;
x2=1;y2=0;
x3=0;y3=-1;
b0=(1-t)^3;
b1=3*t*(1-t)*(1-t);
b2=3*t*t*(1-t);
b3=t^3;
x=simplify(x0*b0+x1*b1+x2*b2+x3*b3)
y=simplify(y0*b0+y1*b1+y2*b2+y3*b3)

xp=diff(x,t)
yp=diff(y,t)
s=simplify(xp^2+yp^2);
factor(s)
```

```
x =

-3*t^2*(t - 1)


y =

- (t - 1)^3 - t^3


xp =

- 6*t*(t - 1) - 3*t^2


yp =

- 3*(t - 1)^2 - 3*t^2


ans =

[ 9, 13*t^4 - 20*t^3 + 12*t^2 - 4*t + 1]
```