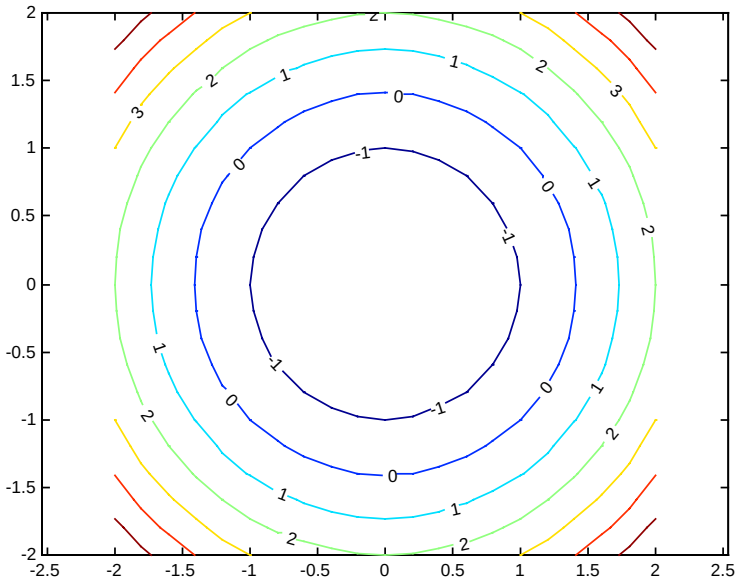
Non-linear function in two dimensions

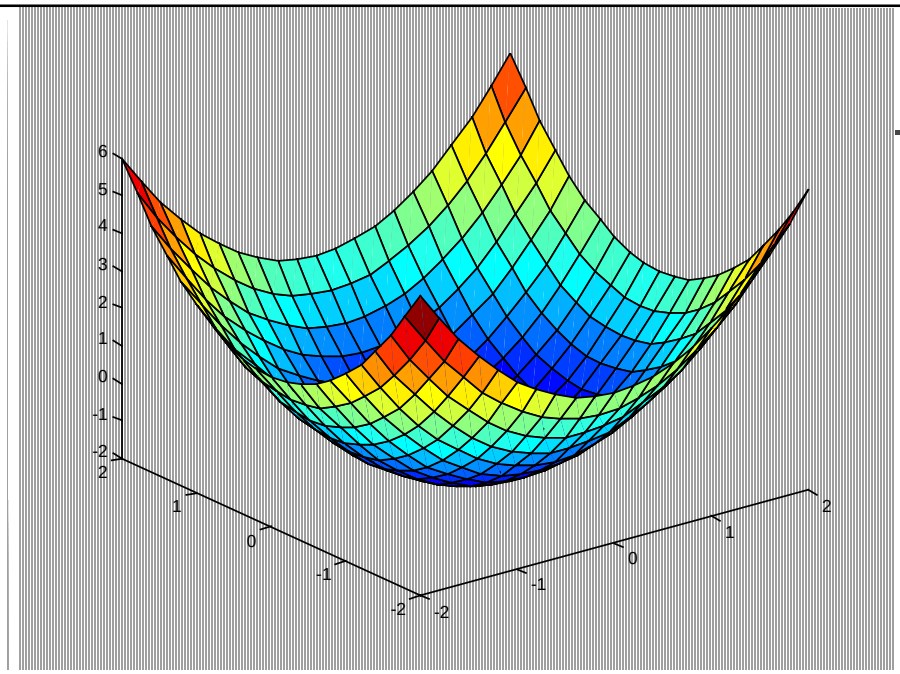
$$z = f(x_1, x_2) = x_1^2 + x_2^2 - 2$$

```
[X1,X2] = meshgrid(-2:.2:2,-2:.2:2);
Z1=X1.^2 + X2.^2 - 2;
figure(1)
[C,h]=contour(X1,X2,Z1);
clabel(C,h)
axis equal
figure(2)
surf(X1,X2,Z1)
Z0=zeros(size(X1));
hold on
mesh(X1,X2,Z0)
```

1

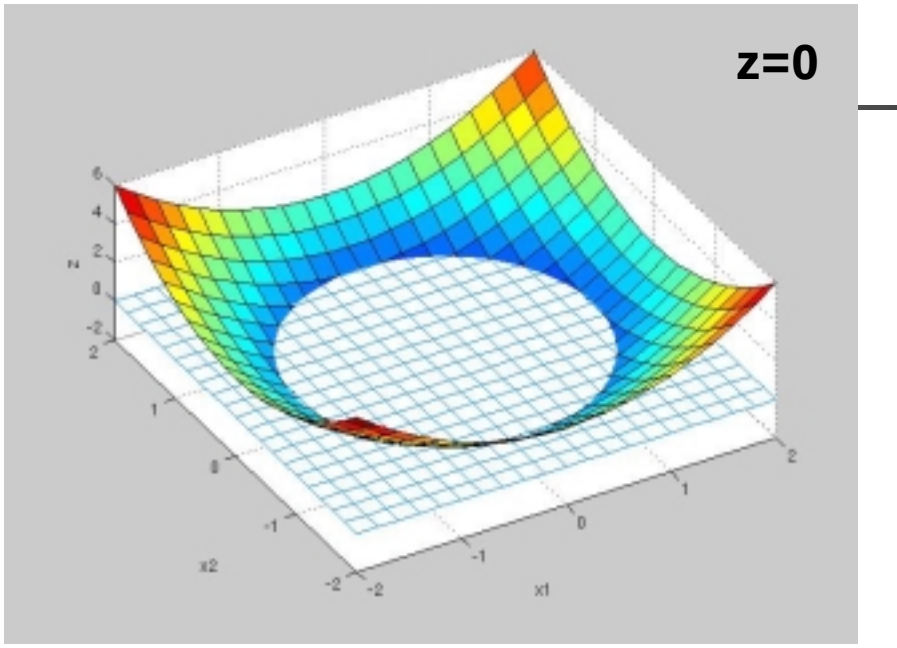


2



3

K_5 - Newtons metod i flera dimensioner



4

K_5 - Newtons metod i flera dimensioner

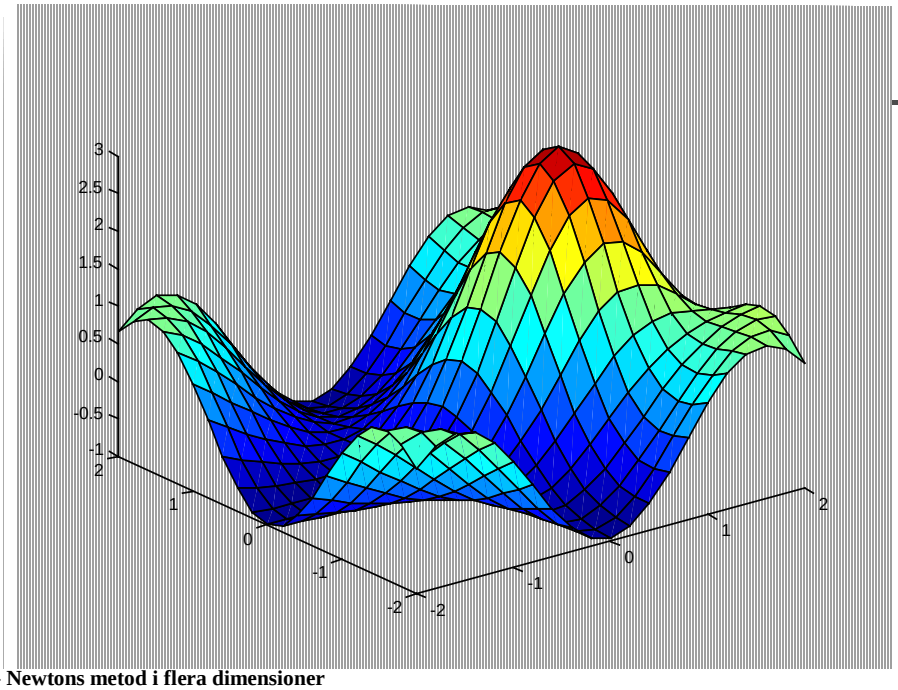
Systems in two dimensions

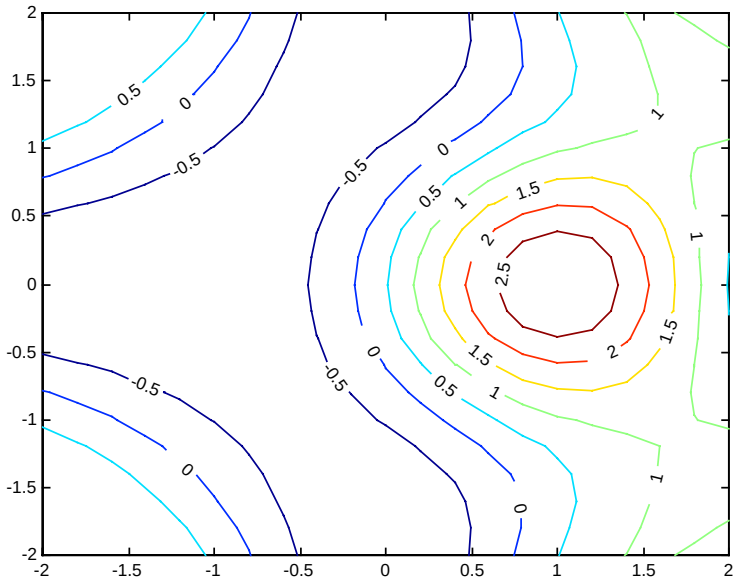
$$z_1 = f(x_1, x_2) = x_1^2 + x_2^2 - 2$$

$$z_2 = g(x_1, x_2) = 4e^{(x_1^2 - 1)^2 - x_2^2} - \cos(x_1 x_2)$$

$$x_1 \in [-2, 2] \qquad x_2 \in [-2, 2]$$

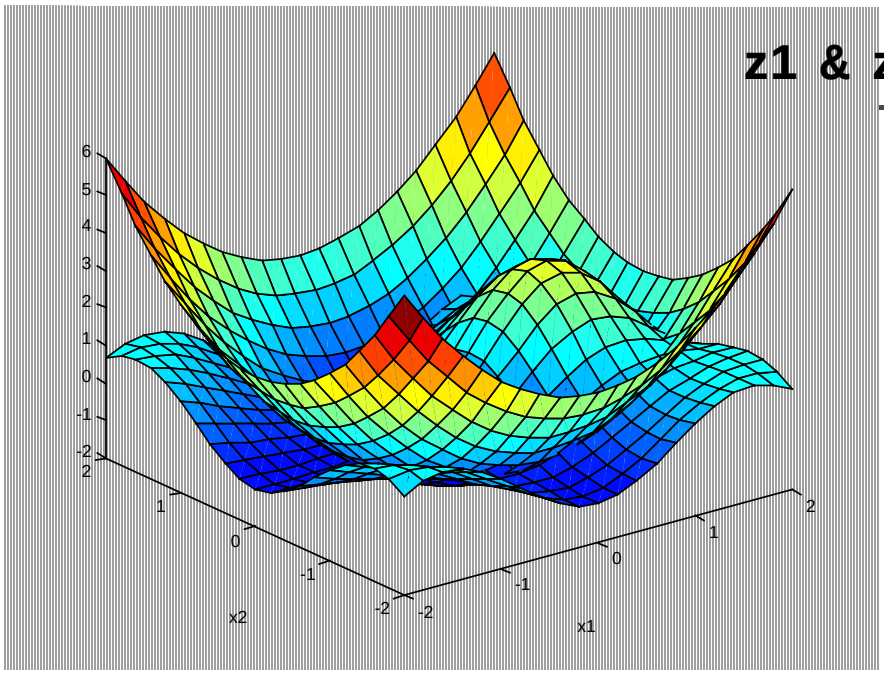
z2





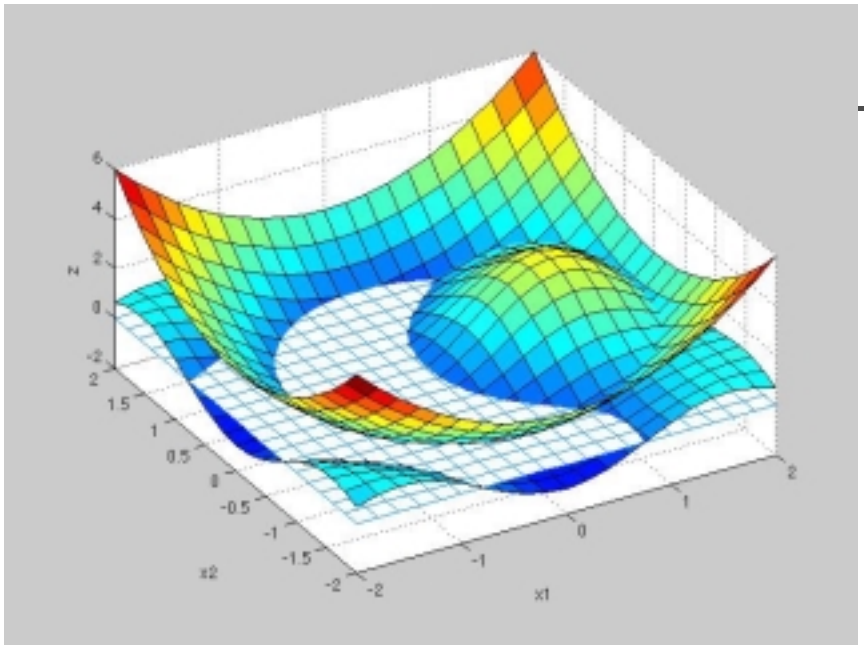
7

K_5 - Newtons metod i flera dimensioner



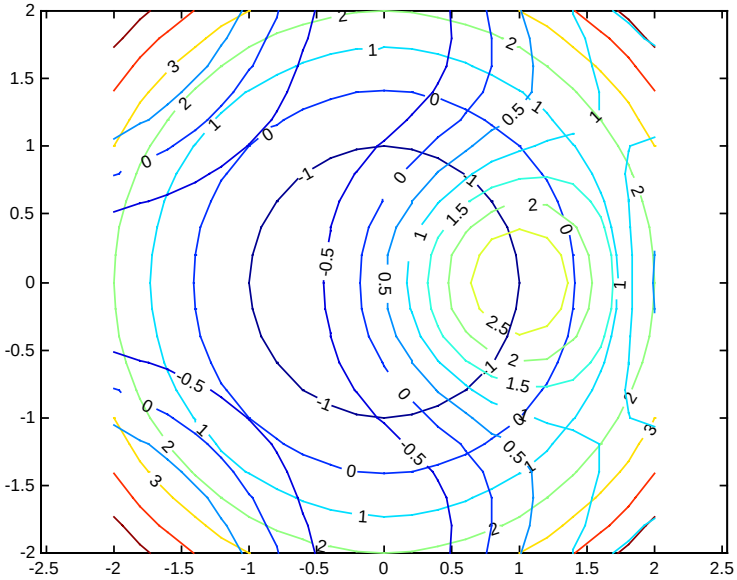
8

K_5 - Newtons metod i flera dimensioner



9

K_5 - Newtons metod i flera dimensioner



10

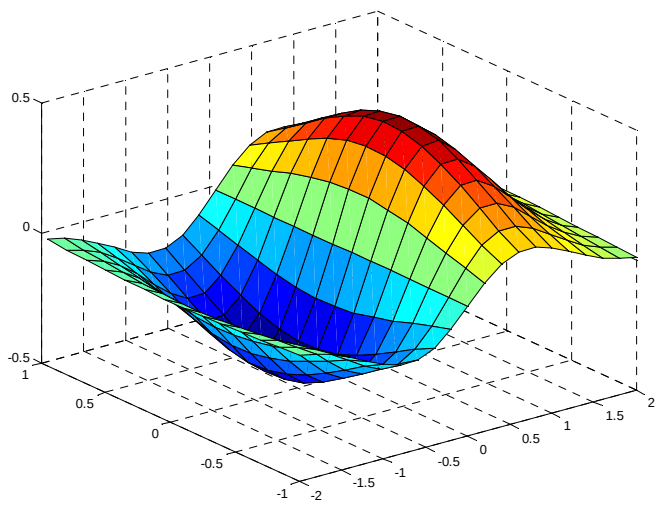
K_5 - Newtons metod i flera dimensioner

Gradient(), Quiver()

```
[x,y] = meshgrid(-2:.2:2,-1:.15:1);
       z = x .* exp(-x.^2 - y.^2);
       [px,py] = gradient(z,.2,.15);
       figure(1)
       surf(x,y,z)
       figure(2)
       contour(x,y,z), hold on
       quiver(x,y,px,py)
       hold off
       axis image
```

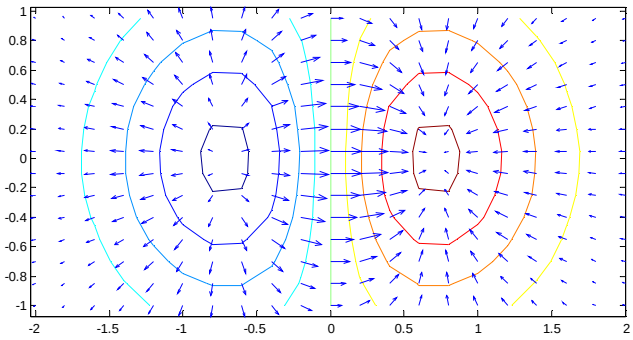
11

xe(-x^2-y^2)



12

gradients



13

Quiver()

Data at two-dim grid points might involve both magnitude and a direction field.

E.g. velocity distribution of a fluid flow or an electrical field

Ex. electrical field with xy-components Fx and Fy

Fx=2(x^2-y^2-1)/[((x+1)^2+y^2)((x-1)^2+y^2)]

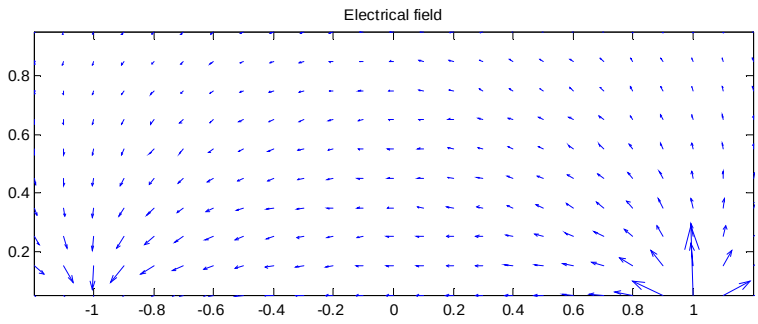
Fy=4xy/[((x+1)^2+y^2)((x-1)^2+y^2)]

```
>> x=-1.2:0.1:1.2;
>> y=0.05:0.1:1;
>> [X, Y, Fx, Fy] = elec(x,y,2);
```

14

```
function [X, Y, Fx, Fy] = elec(xr,yr,scale)
%Compute the electrical field in the plane caused by
%two infinite straight wires that are perpendicular to
%the xy-plane and that pass through the points (1,0) and (-1,0)
%Call: [X, Y, Fx, Fy] = elec(xr,yr,scale)
%where xr and yr define the region and scale>1 increases the
%size of the arrows in the field
%
[X Y]=meshgrid(xr,yr);
DENOM=((X+1).^2+Y.^2).*((X-1).^2+Y.^2);
Fx=2*(X.^2-Y.^2-1)./DENOM;
Fy=4*X.*Y./DENOM;
%Draw the field
hold off
quiver(X,Y,Fx,Fy,scale)
hold on
axis equal
axis([min(xr) max(xr) min(yr) max(yr)])
title('Electrical field')
```

15



16