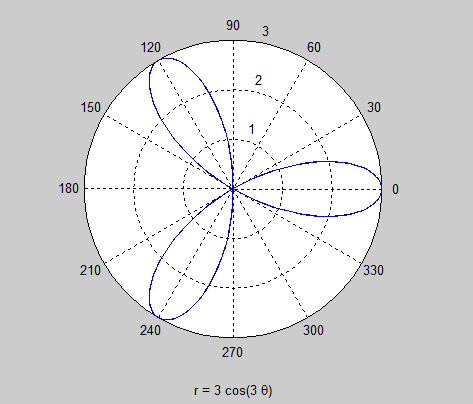
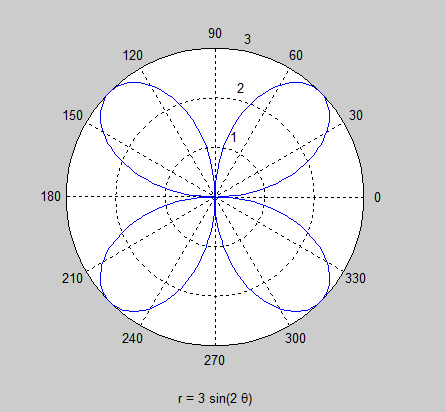
# 第一次上机

## 一元函数作图

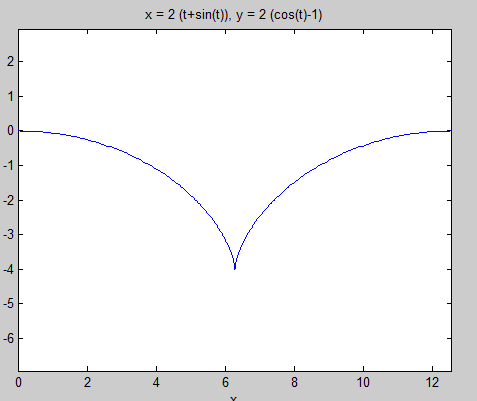
>> ezpolar('3\*cos(3\*theta)',[0,2\*pi])



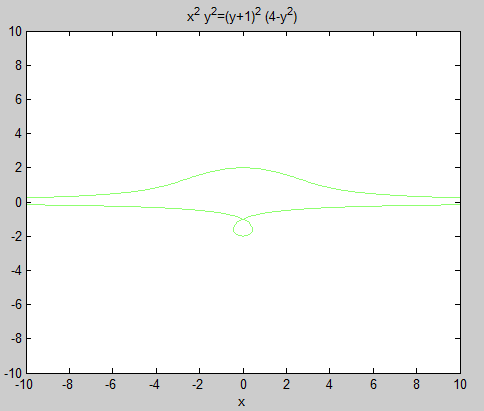
ezpolar('3\*sin(2\*theta)',[0,2\*pi])



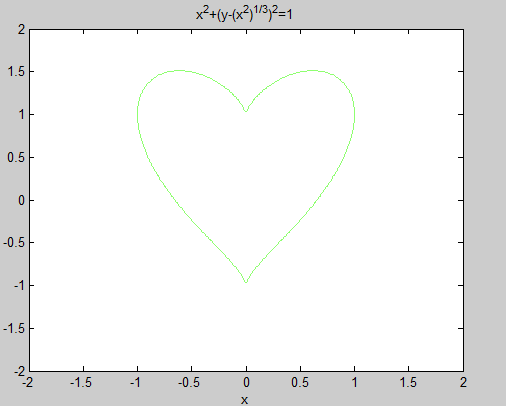
ezplot('2\*(t+sin(t))','2\*(cos(t)-1)',[0,2\*pi])



ezplot('x^2\*y^2=(y+1)^2\*(4-y^2)',[-10,10])



ezplot('x^2+(y-(x^2)^(1/3))^2=1',[-2,2,-2,2])



## 极限和级数

>> limit(((sin(sin(x))))/x-1,x,0)

ans =

0

>> limit((tan(pi/4+1/n))^n,n,inf)

ans =

exp(2)

>> limit(x\*(pi/2-asin(x/sqrt(x^2+1))),x,inf)

ans =

1

>> limit(1/(1+exp(1/(x-1))),x,1,'left')

ans =

1

>> limit(1/(1+exp(1/(x-1))),x,1,'right')

ans =

0

>> s=symsum(1/n^2,n,1,inf)

s =

pi^2/6

>> s=symsum((-1)^(n + 1)/2^n,n,0,inf)

s =

-2/3

## 一元函数微分

>> f=(-1)^(n+1)\*x^(n+1)/(n\*(n+1))

f =

((-1)^(n + 1)\*x^(n + 1))/(n\*(n + 1))

>> s=symsum(f,n,1,inf)

s =

piecewise([abs(x) <= 1, ((-1)^(x + 1)\*x^2\*hypergeom([1, 1], [3], x))/2])

>> syms x y   
>> y=taylor(sin(x),'Order',4)  
   
y =  
   
- x^3/6 + x  
   
>> x=3\*pi/180  
  
x =  
  
    0.0524  
  
>> vpa(eval(y),10)  
   
ans =  
   
0.05233595296

>> syms x y  
>> y=taylor(30^x,'Order',4)  
   
y =  
   
(log(30)^3\*x^3)/6 + (log(30)^2\*x^2)/2 + log(30)\*x + 1  
   
>>  x=1/3  
  
x =  
  
    0.3333  
  
>>  vpa(eval(y),10)  
   
ans =  
   
3.0192808093

>> syms x y  
>> y=taylor(x^(1/2),x,4)  
   
y =  
   
x/4 - (x - 4)^2/64 + (x - 4)^3/512 - (5\*(x - 4)^4)/16384 + (7\*(x - 4)^5)/131072 + 1  
   
>> x=4.4  
  
x =  
  
    4.4000  
  
>> vpa(eval(y),10)  
   
ans =  
   
2.097617734

# 第二次上机

## 微分方程

1、

命令行：

x=-5:0.01:5;

>> for C1=-5:5;

for C2=-5:5

y=C1\*exp(-x)+C2\*exp(x);

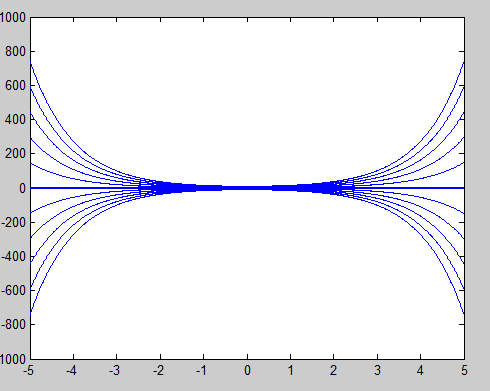
plot(x,y)

axis([-5 5 -1000 1000])

hold on

end

end



2、M文件：

function f=fun(x,y)

f=(-1-x^2\*y\*sin(x))/x;

end

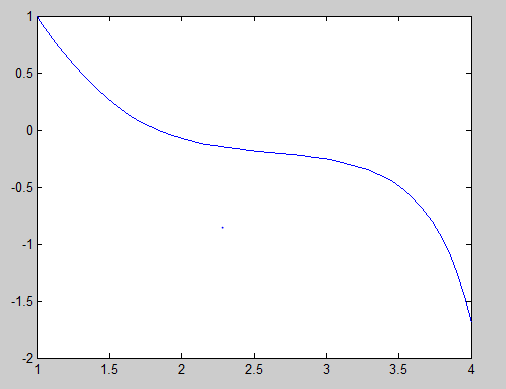
命令行：

x=1:0.2:4;

>> [x,y]=ode45('fun',[1,4],1);

>> plot(x,y)

图像：



## 二次曲面

1、代码：

>> [x,y]=meshgrid(-10:0.1:10);

>> z1=sqrt(x.^2-y.^2);

>> [x,y]=meshgrid(3:0.1:4,1:0.1:2);

>> z1=sqrt(x.^2-y.^2);

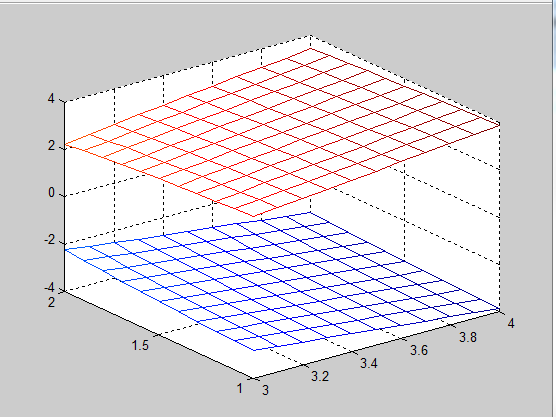
>> mesh(x,y,z1)

>> hold on

>> z2=-sqrt(x.^2-y.^2);

>> mesh(x,y,z2)

图像：

2、命令行：

>> u=[0:0.1:1]';

>> v=0:0.1:2\*pi;

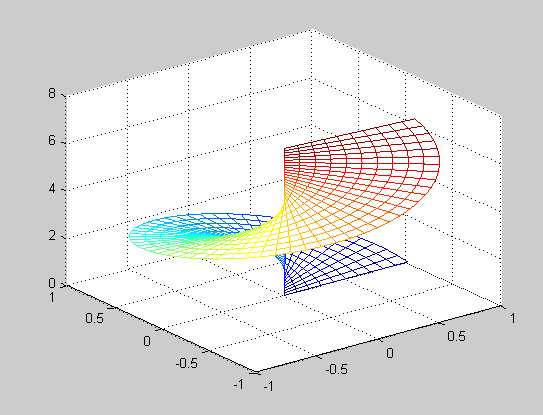
>> x=u\*cos(v);

>> y=u\*sin(v);

>> z=(0\*u+1)\*1\*v;

>> mesh(x,y,z)

图像：



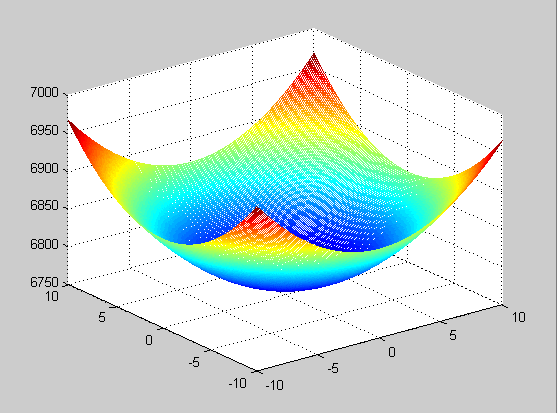
3、

>> [x,y]=meshgrid(-10:0.1:10);

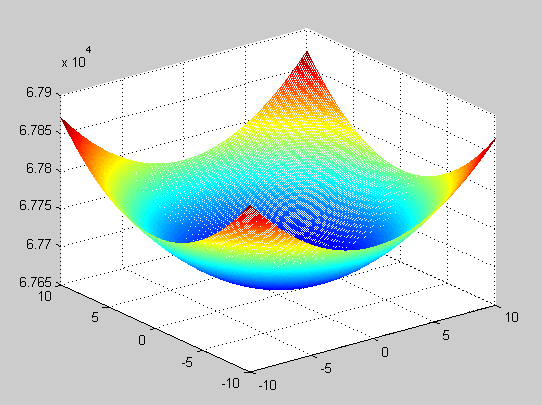
>> z=x.^2+y.^2+k\*x\*y;

>> mesh(x,y,z)

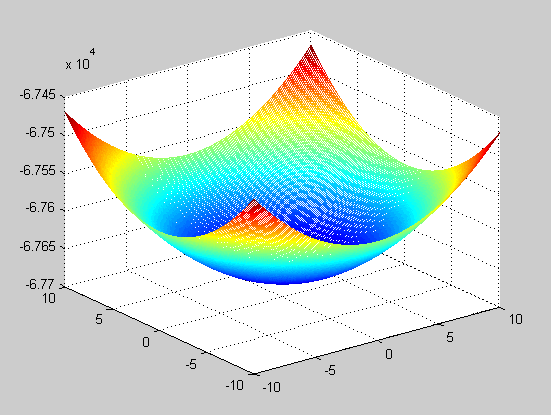
图像：k=1



k=10:



k=-10:



## 多元函数微分学

1、

>> syms x y z;

>> f=sqrt(x^2+y^2)-z;

>> u=diff(f,x);

>> v=diff(f,y);

>> x=1;

>> y=1;

>> z=sqrt(2);

>> a=eval(u);

>> b=eval(v);

>> t=-2:0.1:4;

>> x3=a\*t+1;

>> y3=b\*t+1;

>> z3=-t+sqrt(2);

>> [x,y]=meshgrid(-2:0.1:3);

>> z1=sqrt(x.^2+y.^2);

>> z2=a\*(x-1)+b\*(y-1)+sqrt(2);

>> mesh(x,y,z1)

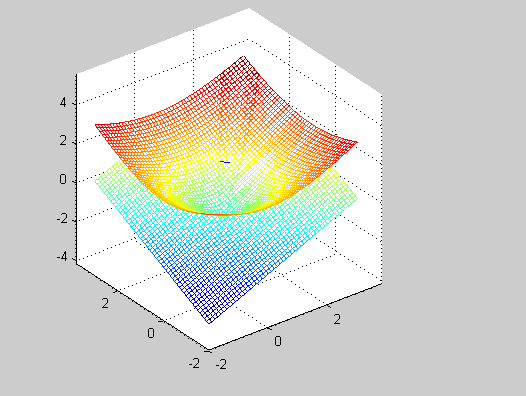
>> hold on

>> mesh(x,y,z2)

>> hold on

>> plot3(x3,y3,z3)

图像：



2、(u)

>> [x,y]=meshgrid(-2:0.01:2);

>> u=x.^2-y.^2;

>> mesh(x,y,u)

>> hold on

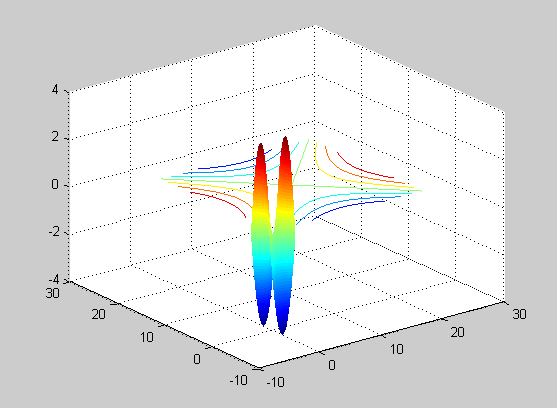
>> x1=linspace(-2,2,25);

>> y1=linspace(-2,2,25);

>> [x,y]=meshgrid(x1,y1);

>> z1=x.^2-y.^2;

>> h=contour(z1);



(v)

>> [x,y]=meshgrid(-2:0.001:2);

>> v=2\*x.\*y;

>> mesh(x,y,v)

>> hold on

>> x1=linspace(-2,2,25);

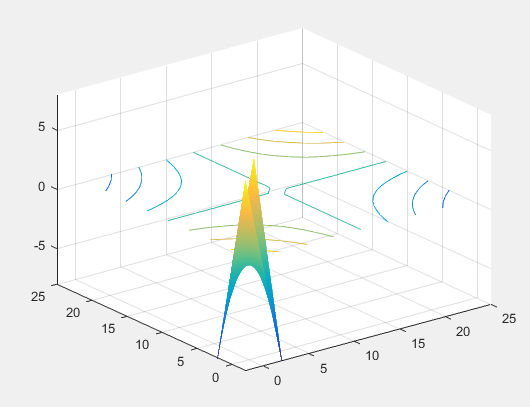
>> y1=linspace(-2,2,25);

>> [x,y]=meshgrid(x1,y1);

>> z2=2\*x.\*y;

>> h=contour(z2);

图像：



3、命令行：

>> x1=linspace(-10,10,1000);

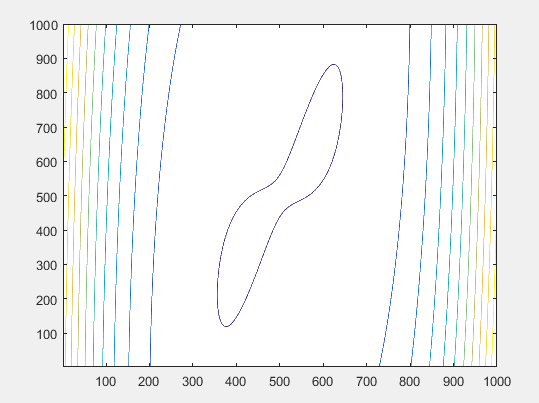
>> y1=linspace(-10,10,1000);

>> [x,y]=meshgrid(x1,y1);

>> f=x.^4-8\*x.\*y+2\*y.^2-3;

>> h=contour(f);

图像：



>> syms x y;

>> f=x^4-8\*x\*y+2\*y\*y-3;

>> dfx=diff(f,x)

dfx =4\*x^3 - 8\*y

>> dfy=diff(f,y)

dfy=4\*y - 8\*x

>> dfxx=diff(f,x,2)

dfxx =12\*x^2

>> dfxy=diff(dfx,y)

dfxy =-8

>> dfyy=diff(f,y,2)

dfyy =4

1. x=0,y=0,dfxx\*dfyy-dfxy^2<0;
2. x=2,y=4,dfxx\*dfyy-dfxy^2>0,,dfxx>0,极小值f(2,4)=-10;
3. x=-2,y=-4,dfxx\*dfyy-dfxy^2>0,dfxx>0, 极小值f(-2,-4)=-1；

## 多元函数积分学

1、

>> syms r t;

>> int(int(r^2,r,0,1),t,0,2\*pi)

ans =(2\*pi)/3

2、>> syms p x y;

>> int(int(int(p^2\*sin(x)\*sin(x)\*p^2\*sin(x),p,1,2),x,0,pi),y,0,2\*pi)

ans =(248\*pi)/15

3、

>>syms x1 y1 z1 x2 y2 z2;

>> y1=sqrt(1-x1\*x1-z1\*z1);

>> dyx=diff(y1,x1)

dyx =

-x1/(- x1^2 - z1^2 + 1)^(1/2)

>> z2=sqrt(1-x2\*x2-y2\*y2);

>> dzx=diff(z2,x2)

dzx =

-x2/(- x2^2 - y2^2 + 1)^(1/2)

>> int(1\*sqrt(1+1+(-x/(-x^2-x^2+1)^(1/2))^2),x,-sqrt(2/x),sqrt(x)/2)

ans =

int((2 - x^2/(2\*x^2 - 1))^(1/2), x, -2^(1/2)\*(1/x)^(1/2), x^(1/2)/2)

4、

>> syms x y z1 z2;

>> z1=sqrt(1-x\*x-y\*y)+1;

>> dz1x=diff(z1,x)

dz1x =

-x/(- x^2 - y^2 + 1)^(1/2)

>> dz1y=diff(z1,y)

dz1y =

-y/(- x^2 - y^2 + 1)^(1/2)

int(int((x\*x+y\*y+z1\*z1-2\*z1)\*sqrt(1+dz1x^2+dz1y^2),x,-sqrt(2\*z1-z1^2-y^2),sqrt(2\*z1-z1^2-y^2)),y,1/4,1/2)

ans =

0

>> z2=-sqrt(1-x\*x-y\*y)+1;

>> dz2x=diff(z2,x)

dz2x =

x/(- x^2 - y^2 + 1)^(1/2)

dz2y=diff(z2,y)

dz2y =

y/(- x^2 - y^2 + 1)^(1/2)

int(int((x\*x+y\*y+z2\*z2-2\*z2)\*sqrt(1+dz2x^2+dz2y^2),x,-sqrt(2\*z2-z2^2-y^2),sqrt(2\*z2-z2^2-y^2)),y,1/4,1/2)

ans =

0