Limits and Continuity

Aim

- To visualize the limits and continuity of the given function $F(x,y)$ at (x_0,y_0) using MATLAB

Mathematical form

- If $f(x,y) \to L_1$ as $(x,y) \to (a,b)$ along the path c_1 and $f(x,y) \to L_2$ as $(x,y) \to (a,b)$ along the path c_2 where $L_1 \neq L_2$ then $\lim_{(x,y)\to(a,b)} f(x,y)$ does not exists.

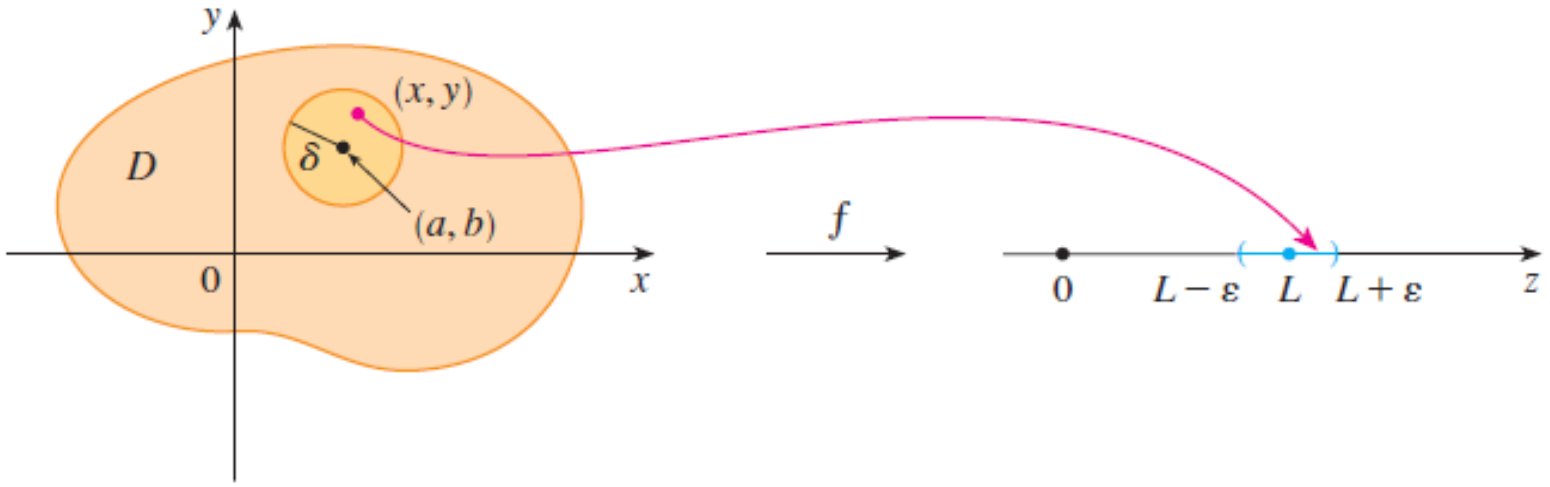
plot3(X1, Y1, Z1...)	Displays a three-dimensional plot of a set of data points.
limit(expr, x,a)	Computes bidirectional limit of the symbolic expression expr when x approaches *a*.

Definition 1:- Let f be a function of two variables whose domain D includes points arbitrarily close to (a, b). Then we say that the **limit of** $f(x, y)$ **as** (x, y) **approaches** (a, b) is L and we write

$$\lim_{(x,y)\to(a,b)} f(x, y) = L$$

if for every number $\varepsilon > 0$ there is a corresponding number $\delta > 0$ such that

if $(x, y) \in D$ and $0 < \sqrt{(x-a)^2 + (y-b)^2} < \delta$ then $|f(x, y) - L| < \varepsilon$



```
clc
clear all
syms x y
f=input('Enter the function f in terms of x and y ');
x0=input('Enter the value of x0');
y0=input('Enter the value of y0');
L1=limit(subs(f,y,y0),x,x0)
L2=limit(subs(f,x,x0),y,y0)
if ((L1~=L2))
disp('Limit does not exist and the function is not continuous at (x0,y0)')
else
disp('Limit of the function along the axis are equal at (x0,y0)')
```

```
m=input('Enter the value of m as a natural number');
y1=y0+(x-x0)^m
L3=limit(subs(f,y,y1),x,x0)
if((L1==L2)&&(L2~=L3))
disp('Limit does not exist and the function is not continuous at (x0,y0)')
else
n=input('Enter the value of n as a natural number');
x1=x0+(y-y0)^m
L4=limit(subs(f,x,x1),y,y0)
if((L1==L2)&&(L2==L3)&&(L3==L4))
disp('Limit of the function may exist at (x0,y0)')
else
disp('Limit does not exist')
end
```

```
f_x0_y0=subs((subs(f,x,x0)),y,y0)
if ((L1==L2)&&(L2==L3)&&(L3==L4)&&(L4==f_x0_y0))
disp('Function may be continuous at (x0,y0)')
else
disp('Function is not continuous at (x0,y0)')
end
end
end
```