20BCE1548-TIRTH VISHALBHAI DAVE

EXP-7

Q1-

Show that $\lim_{(x,y)\to(x0,y0)} (x^2 - y^2)/(x^2 + y^2)$

does not exist.

CODE: -

```
format compact
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(limit(f,y,y0),x,x0);
L2=limit(limit(f,x,x0),y,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);
n=input('Enter the value of n as a natural number
: ');
x1=x0+(y-y0)^n;
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)')
f_x0_y0=input('Enter the value of f at (x0,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

else
output=['Limit does not exist since limit along
path y=',num2str(m),'x and limit along path
y=x^',num2str(n),'is not equal'];
disp(output)
```

```
end
```

OUTPUT: -

Enter the function f in terms of x and y : (x^2-y^2)/(x^2+y^2)

Enter the value of x0 : 0

Enter the value of y0 : 0

Enter the value of m as a natural number : 4

Enter the value of n as a natural number : 5

Limit does not exist since limit along path y=4x and limit along path y=x^5is not equal

Q2

Check the continuity of the following functions

$$f(x,y)=\begin{cases}\sin(x^2+y^2)/(x^2+y^2), if\,(x,y)=(0,0)\\ 1, if\,(x,y)=(0,0)\end{cases}$$

CODE: -

```
format compact
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(limit(f,y,y0),x,x0);
L2=limit(limit(f,x,x0),y,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);
n=input('Enter the value of n as a natural number
: ');
x1=x0+(y-y0)^n;
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)')
f_x0_y0=input('Enter the value of f at (x0,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

else
output=['Limit does not exist since limit along
path y=',num2str(m),'x and limit along path
y=x^',num2str(n),'is not equal'];
disp(output)
end
```

OUTPUT: -

Enter the function f in terms of x and y : sin(x^2+y^2)/(x^2+y^2)

Enter the value of x0 : 0

Enter the value of y0 : 0

Enter the value of m as a natural number : 2

Enter the value of n as a natural number : 3

Limit of the function may exist at (x0,y0)

Enter the value of f at (x0,y0)1

Function may be continuous at (x0,y0)

Q3

Lim [(x-y)/(x+y)] as x -> 0 and y ->0

CODE: -

```
format compact
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(limit(f,y,y0),x,x0);
L2=limit(limit(f,x,x0),y,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);
n=input('Enter the value of n as a natural number
: ');
x1=x0+(y-y0)^n;
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)')
f_x0_y0=input('Enter the value of f at (x0,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

else
output=['Limit does not exist since limit along
path y=',num2str(m),'x and limit along path
y=x^',num2str(n),'is not equal'];
disp(output)
end
```

OUTPUT: -

Enter the function f in terms of x and y : [(x-y)/(x+y)]

Enter the value of x0 : 0

Enter the value of y0 : 0

Enter the value of m as a natural number : 1

Enter the value of n as a natural number : 2

Limit does not exist since limit along path y=1x and limit along path y=x^2is not equal

Q4

Lim [x^2*y/(x^4+y^4)] as x -> 0 and y ->0

CODE: -

```
format compact
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(limit(f,y,y0),x,x0);
L2=limit(limit(f,x,x0),y,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);
n=input('Enter the value of n as a natural number
: ');
x1=x0+(y-y0)^n;
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)')
f_x0_y0=input('Enter the value of f at (x0,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

else
output=['Limit does not exist since limit along
path y=',num2str(m),'x and limit along path
y=x^',num2str(n),'is not equal'];
disp(output)
end
```

OUTPUT: -

Enter the function f in terms of x and y : [x^2*y/(x^4+y^4)]

Enter the value of x0 : 0

Enter the value of y0 : 0

Enter the value of m as a natural number : 6

Enter the value of n as a natural number : 7

Limit of the function may exist at (x0,y0)

Enter the value of f at (x0,y0)NaN

Function is not continuous at (x0,y0)

Q5

Lim [2*x^2*y/(x^4+y^2)] as x -> 0 and y ->0

CODE: -

```
format compact
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(limit(f,y,y0),x,x0);
L2=limit(limit(f,x,x0),y,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);
n=input('Enter the value of n as a natural number
: ');
x1=x0+(y-y0)^n;
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)')
f_x0_y0=input('Enter the value of f at (x0,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

else
output=['Limit does not exist since limit along
path y=',num2str(m),'x and limit along path
y=x^',num2str(n),'is not equal'];
disp(output)
end
```

OUTPUT: -

Enter the function f in terms of x and y : [2*x^2*y/(x^4+y^2)]

Enter the value of x0 : 0

Enter the value of y0 : 0

Enter the value of m as a natural number : 2

Enter the value of n as a natural number : 5

Limit does not exist since limit along path y=2x and limit along path y=x^5is not equal

Q6

Lim [(x*(y-1))/(y*(x-1))] as x -> 1 and y ->1

CODE: -

```
format compact
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(limit(f,y,y0),x,x0);
```

```
L2=limit(limit(f,x,x0),y,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);
n=input('Enter the value of n as a natural number
: ');
x1=x0+(y-y0)^n;
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)')
f_x0_y0=input('Enter the value of f at (x0,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

else
output=['Limit does not exist since limit along
path y=',num2str(m),'x and limit along path
y=x^',num2str(n),'is not equal'];
disp(output)
end
```

OUTPUT: -

Enter the function f in terms of x and y : [(x*(y-1))/(y*(x-1))]

Enter the value of x0 : 1

Enter the value of y0 : 1

Enter the value of m as a natural number : 8

Enter the value of n as a natural number : 5

Limit does not exist since limit along path y=8x and limit along path y=x^5is not equal

Q6

Lim [(x^4-y^2)/(x^4+y^2)] as x -> 0 and y ->0

CODE: -

```
format compact
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(limit(f,y,y0),x,x0);
L2=limit(limit(f,x,x0),y,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);
n=input('Enter the value of n as a natural number
: ');
x1=x0+(y-y0)^n;
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)')
f_x0_y0=input('Enter the value of f at (x0,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

else
output=['Limit does not exist since limit along
path y=',num2str(m),'x and limit along path
y=x^',num2str(n),'is not equal'];
disp(output)
end
```

OUTPUT: -

Enter the function f in terms of x and y : [(x^4-y^2)/(x^4+y^2)]

Enter the value of x0 : 0

Enter the value of y0 : 0

Enter the value of m as a natural number : 3

Enter the value of n as a natural number : 7

Limit does not exist since limit along path y=3x and limit along path y=x^7is not equal

Q7

Lim [x*y/abs(x*y)] as x -> 0 and y ->0

CODE: -

```
format compact
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(limit(f,y,y0),x,x0);
L2=limit(limit(f,x,x0),y,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);
n=input('Enter the value of n as a natural number
: ');
x1=x0+(y-y0)^n;
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)')
f_x0_y0=input('Enter the value of f at (x0,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

else
output=['Limit does not exist since limit along
path y=',num2str(m),'x and limit along path
y=x^',num2str(n),'is not equal'];
disp(output)
end
```

OUTPUT: -

Enter the function f in terms of x and y : [x*y/abs(x*y)]

Enter the value of x0 : 0

Enter the value of y0 : 0

Enter the value of m as a natural number : 3

Enter the value of n as a natural number : 9

Limit does not exist since limit along path y=3x and limit along path y=x^9is not equal