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College Sangamner

DEPARTMENT OF COMPUTER SCIENCE

Sub : Mathematics

Remark
Demonstrator's
Signature
Date:- / /20

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Title of the expt:-__Slip no 4_____Page.no:-_____Class:-_____BCS_____

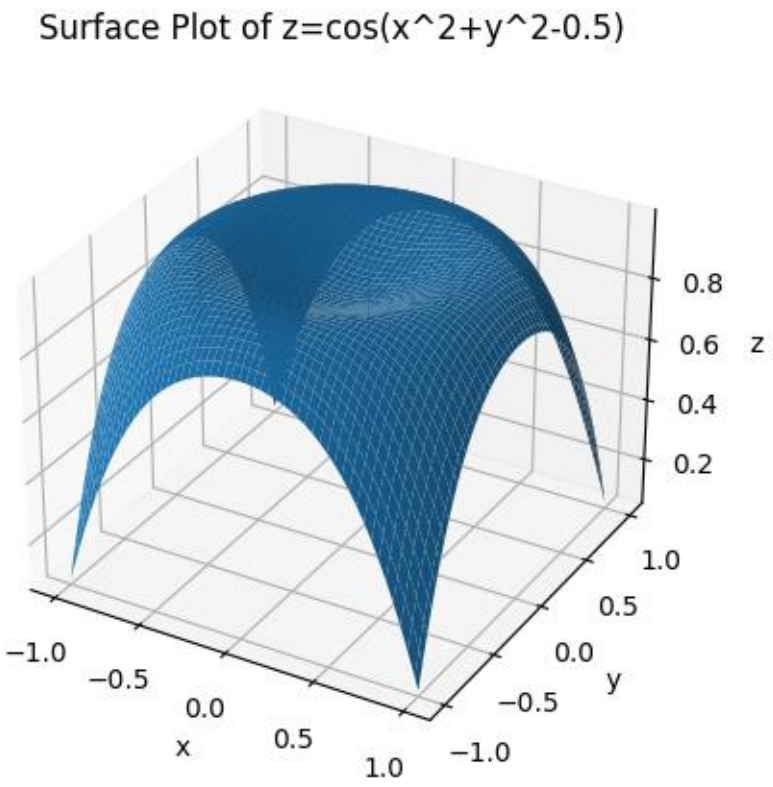
Q1 Attempt any ONE of the following

A) Using Python plot the surface plot the function $z=\cos(x^2+y^2-0.5)$ in the intervalfrom -1< x,y<1

→

```
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D

# Create a meshgrid of x and y values
x = np.linspace(-1, 1, 100)
y = np.linspace(-1, 1, 100)
X, Y = np.meshgrid(x, y)

# Calculate the values of z for each (x, y) pair
Z = np.cos(X**2 + Y**2 - 0.5)

# Create a 3D plot
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
ax.plot_surface(X, Y, Z)

# Set the labels for the axes and the title of the plot
ax.set_xlabel('x')
ax.set_ylabel('y')
ax.set_zlabel('z')
ax.set_title('Surface Plot of z=cos(x^2+y^2-0.5)')

# Show the plot
plt.show()
```

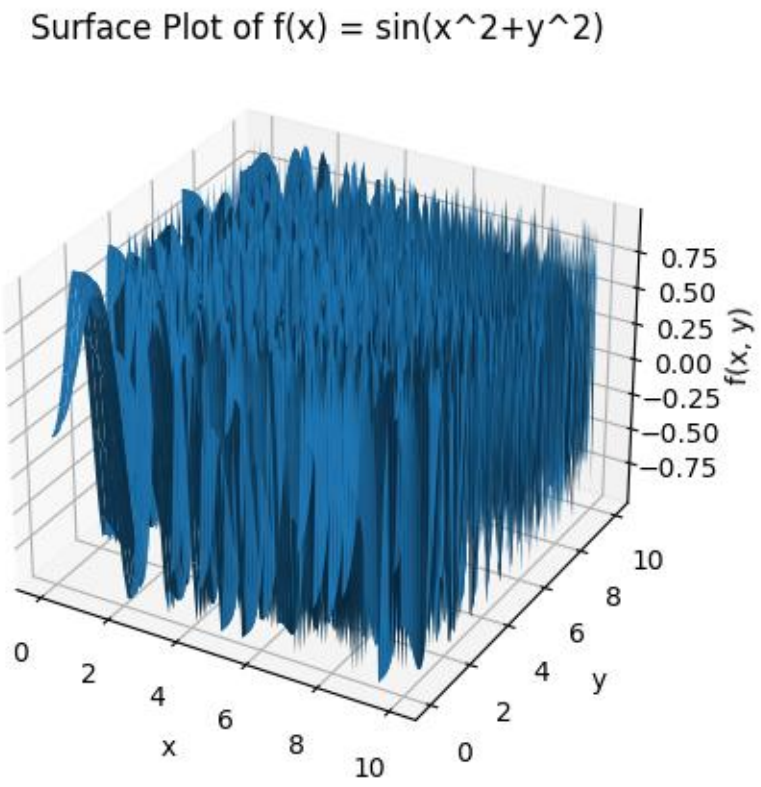
output :



B) Generate 3D surface plot for the function f(x)=sin(x^2+y^2) in the interval [0,10]
-→

```
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D

def f(x, y):
    return np.sin(x**2 + y**2)

x = np.linspace(0, 10, 100)
y = np.linspace(0, 10, 100)
X, Y = np.meshgrid(x, y)

Z = f(X, Y)
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
ax.plot_surface(X, Y, Z)
ax.set_xlabel('x')
ax.set_ylabel('y')
ax.set_zlabel('f(x, y)')
ax.set_title('Surface Plot of f(x) = sin(x^2+y^2)')
plt.show()
```

output :

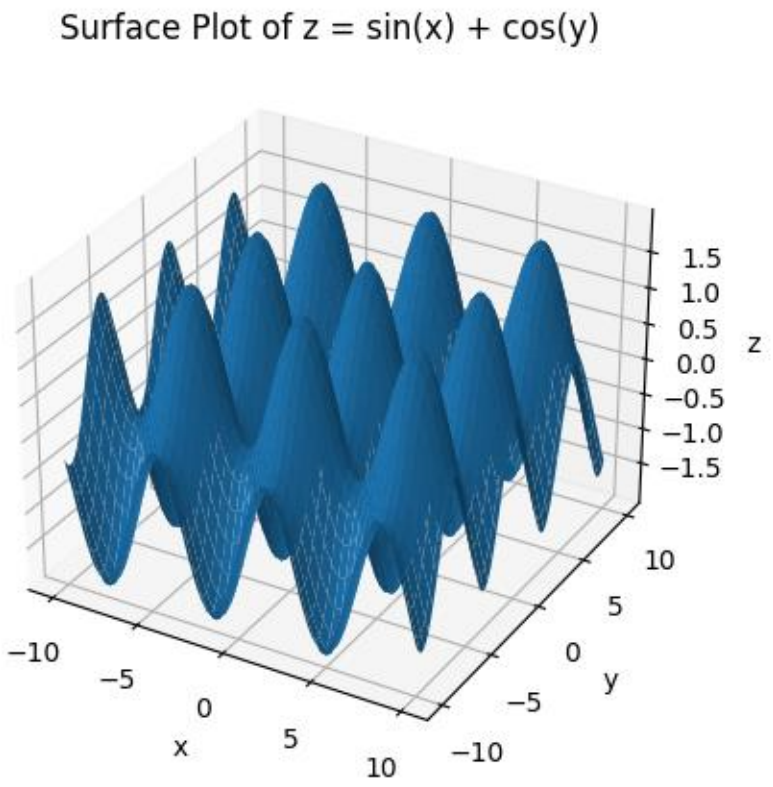


c) Write a python program to generate 3D plot of the function z=sin X+cos Y in the interval -10 <x ,y <10

→

```
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
def f(x, y):
    return np.sin(x) + np.cos(y)

x = np.linspace(-10, 10, 100)
y = np.linspace(-10, 10, 100)
X, Y = np.meshgrid(x, y)
Z = f(X, Y)
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
ax.plot_surface(X, Y, Z)
ax.set_xlabel('x')
ax.set_ylabel('y')
ax.set_zlabel('z')
ax.set_title('Surface Plot of z = sin(x) + cos(y)')
plt.show()
```

output :



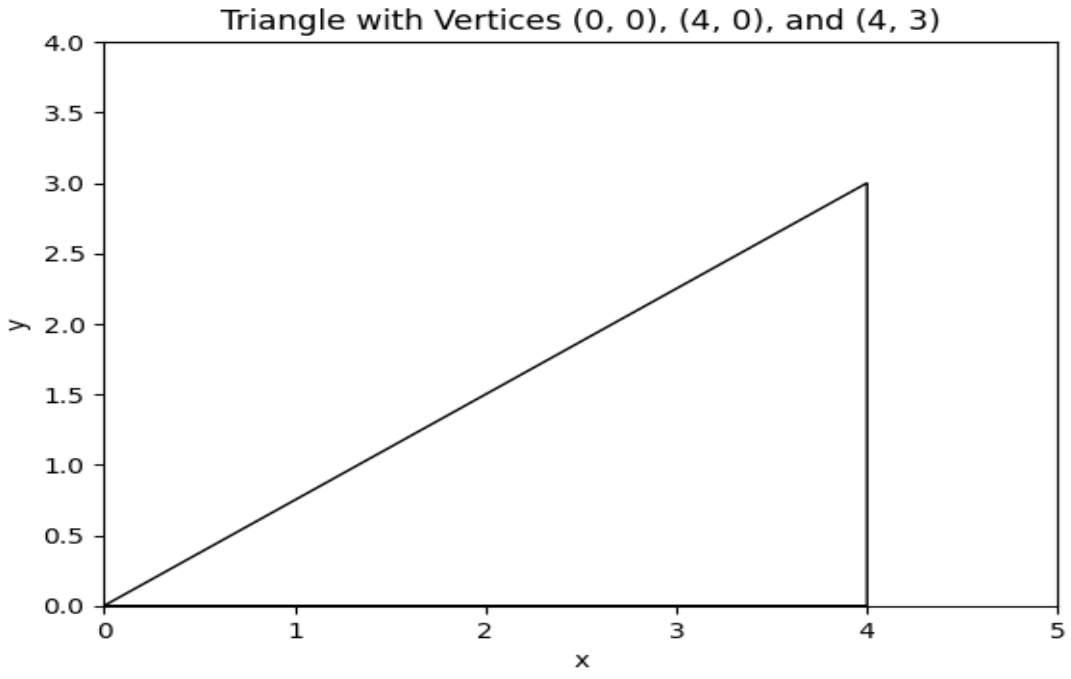
Q 2 Attempt any TWO of the following

A) Using python generate triangle with vertices (0,0),(4,0),(4,3) check wheter the tringle is Right angle tringle

→

```
import matplotlib.pyplot as plt
vertices = [(0, 0), (4, 0), (4, 3)]
triangle = plt.Polygon(vertices, closed=True, fill=False)
fig, ax = plt.subplots()
ax.add_patch(triangle)
ax.set_xlim([0, 5])
ax.set_ylim([0, 4])
ax.set_xlabel('x')
ax.set_ylabel('y')
ax.set_title('Triangle with Vertices (0, 0), (4, 0), and (4, 3)')
plt.show()
```

output :



:

B) Generate vector x in interval [-7,7] using numpy package with 50 subintervals
→

```
import numpy as np
n = 50
x = np.linspace(-7, 7, n)
print(x)
```

output :

```
[-7.         -6.71428571 -6.42857143 -6.14285714 -5.85714286 -5.57142857
-5.28571429 -5.         -4.71428571 -4.42857143 -4.14285714 -3.85714286
-3.57142857 -3.28571429 -3.         -2.71428571 -2.42857143 -2.14285714
-1.85714286 -1.57142857 -1.28571429 -1.         -0.71428571 -0.42857143
-0.14285714  0.14285714  0.42857143  0.71428571  1.          1.28571429
 1.57142857  1.85714286  2.14285714  2.42857143  2.71428571  3.
 3.28571429  3.57142857  3.85714286  4.14285714  4.42857143  4.71428571
 5.          5.28571429  5.57142857  5.85714286  6.14285714  6.42857143
 6.71428571  7.        ]
```

C) Write a python program to find the area and perimeter of the ∆ABC ,where A[0,0],B[6,0],C[4,4]

→

```
import math

A = [0, 0]
B = [6, 0]
C = [4, 4]

AB = math.sqrt((B[0]-A[0])**2 + (B[1]-A[1])**2)
BC = math.sqrt((C[0]-B[0])**2 + (C[1]-B[1])**2)
CA = math.sqrt((A[0]-C[0])**2 + (A[1]-C[1])**2)
perimeter = AB + BC + CA
s = perimeter / 2
area = math.sqrt(s * (s - AB) * (s - BC) * (s - CA))
print("Perimeter of the triangle: {:.2f}".format(perimeter))
print("Area of the triangle: {:.2f}".format(area))
```

output :

```
Perimeter of the triangle: 16.13
Area of the triangle: 12.00
```

Q3 Attempt the following

A) Attempt any ONE of the following

I) Write a Python program to solve the following LPP :

MAX Z=5x+3y

Subject to x+y≤20

2x+5y≤1

X,y≥0

→

```
import pulp

problem = pulp.LpProblem("Maximizing Z", pulp.LpMaximize)
x = pulp.LpVariable('x', lowBound=0, cat='Continuous')
y = pulp.LpVariable('y', lowBound=0, cat='Continuous')
problem += 5*x + 3*y, "Z"
problem += x + y <= 20, "Constraint 1"
problem += 2*x + 5*y <= 10, "Constraint 2"
status = problem.solve()

print("Solution status:", pulp.LpStatus[status])
```

```
print("Optimal solution:")
print("x =", pulp.value(x))
print("y =", pulp.value(y))
print("Z =", pulp.value(problem.objective))
```

II) Write a python program to display the following LPP by using pulp module and simplex method Find its optimal solution if exist

Max Z=4x+y+3z+5w
Subject to 4x+6y-5z-4w≥20
-3x-2y+4z+w≤10
-8x-3y+3z+2w≤20
X+y≤11
X,y,z,w≥0

→

```
import pulp

problem = pulp.LpProblem("Maximizing Z", pulp.LpMaximize)
x = pulp.LpVariable('x', lowBound=0, cat='Continuous')
y = pulp.LpVariable('y', lowBound=0, cat='Continuous')
z = pulp.LpVariable('z', lowBound=0, cat='Continuous')
w = pulp.LpVariable('w', lowBound=0, cat='Continuous')

problem += 4*x + y + 3*z + 5*w, "Z"
problem += 4*x + 6*y - 5*z - 4*w >= 20, "Constraint 1"
problem += -3*x - 2*y + 4*z + w <= 10, "Constraint 2"
problem += -8*x - 3*y + 3*z + 2*w <= 20, "Constraint 3"
problem += x + y <= 11, "Constraint 4"

status = problem.solve()
print("Solution status:", pulp.LpStatus[status])
print("Optimal solution:")
print("x =", pulp.value(x))
print("y =", pulp.value(y))
print("z =", pulp.value(z))
print("w =", pulp.value(w))
print("Z =", pulp.value(problem.objective))
```

B) Attempt any ONE of the following

I) Apply Python program in each of the following transformation on the point P[3,8]
A) Reflection through X- axis
B) Scaling in X- coordinate by factor 6
C) Rotation about origin thr
ough an angel 30◦
D) Reflection through the line y=-x
→

```
P = [3, 8]
P_reflected = [P[0], -P[1]]
print("Reflected point:", P_reflected)

P = [3, 8]
P_scaled = [6 * P[0], P[1]]
print("Scaled point:", P_scaled)

import math
P = [3, 8]
angle = math.radians(30)
P_rotated = [P[0] * math.cos(angle) - P[1] * math.sin(angle),
        P[0] * math.sin(angle) + P[1] * math.cos(angle)]
print("Rotated point:", P_rotated)

P = [3, 8]
P_reflected = [(P[1] + P[0]) / 2, (P[1] + P[0]) / 2]
print("Reflected point:", P_reflected)
```

output :

```
Reflected point: [3, -8]
Scaled point: [18, 8]
Rotated point: [-1.4019237886466835, 8.428203230275509]
Reflected point: [5.5, 5.5]
```

II) Write a Python program to plot 2D x-axis and Y-axis in black color,in the same diagram plot
A)Green triangle with vertices [5,4],[7,4],[6,6]
B) Blue rectangle with vertices [2,2],[10,2],[10,8],[2,8]
C) Red polygon with vertices [6,2],[10,4],[8,7],[2,4]
D) Isosceles triangle with vertices [0,0],[4,0],[2,4]

→

```
import matplotlib.pyplot as plt
triangle = plt.Polygon([[5, 4], [7, 4], [6, 6]], color='green')
plt.gca().add_patch(triangle)

rectangle = plt.Polygon([[2, 2], [10, 2], [10, 8], [2, 8]], color='blue')
plt.gca().add_patch(rectangle)

polygon = plt.Polygon([[6, 2], [10, 4], [8, 7], [2, 4]], color='red')
plt.gca().add_patch(polygon)

triangle = plt.Polygon([[0, 0], [4, 0], [2, 4]], color='black')
plt.gca().add_patch(triangle)
plt.axhline(0, color='black')
plt.axvline(0, color='black')
plt.xlim(-2, 12)
plt.ylim(-2, 10)
plt.show()
```