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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________

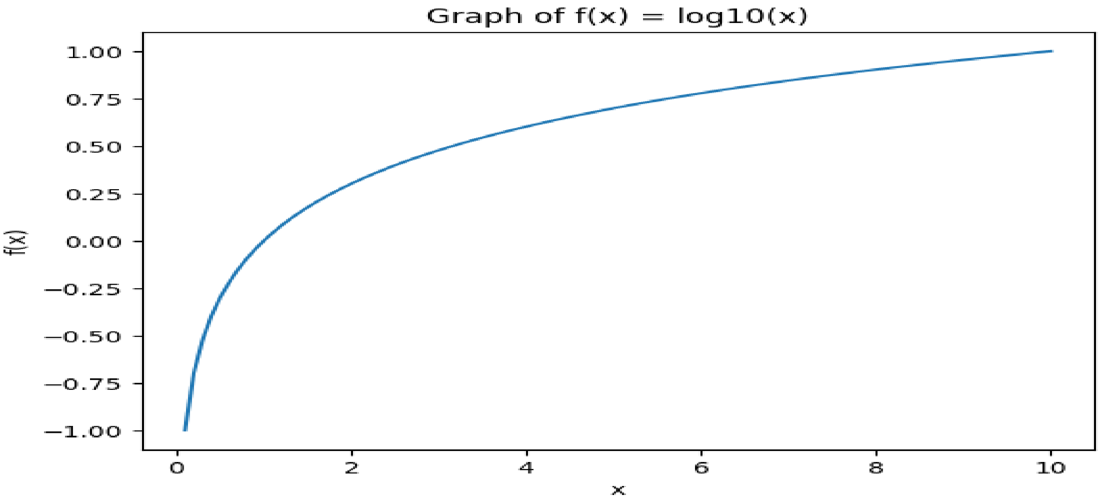
Q1. Attempt any of the following

A) Write a python program to plot 2D graph of the function f(x)=log$_{10}$(x) in the interval [0,10]

→

```
   import numpy as np
import matplotlib.pyplot as plt
def f(x):
    return np.log10(x)

x = np.linspace(0.1, 10, 100)
y = f(x)
plt.plot(x, y)
plt.xlabel('x')
plt.ylabel('f(x)')
plt.title('Graph of f(x) = log10(x)')
plt.show()
```

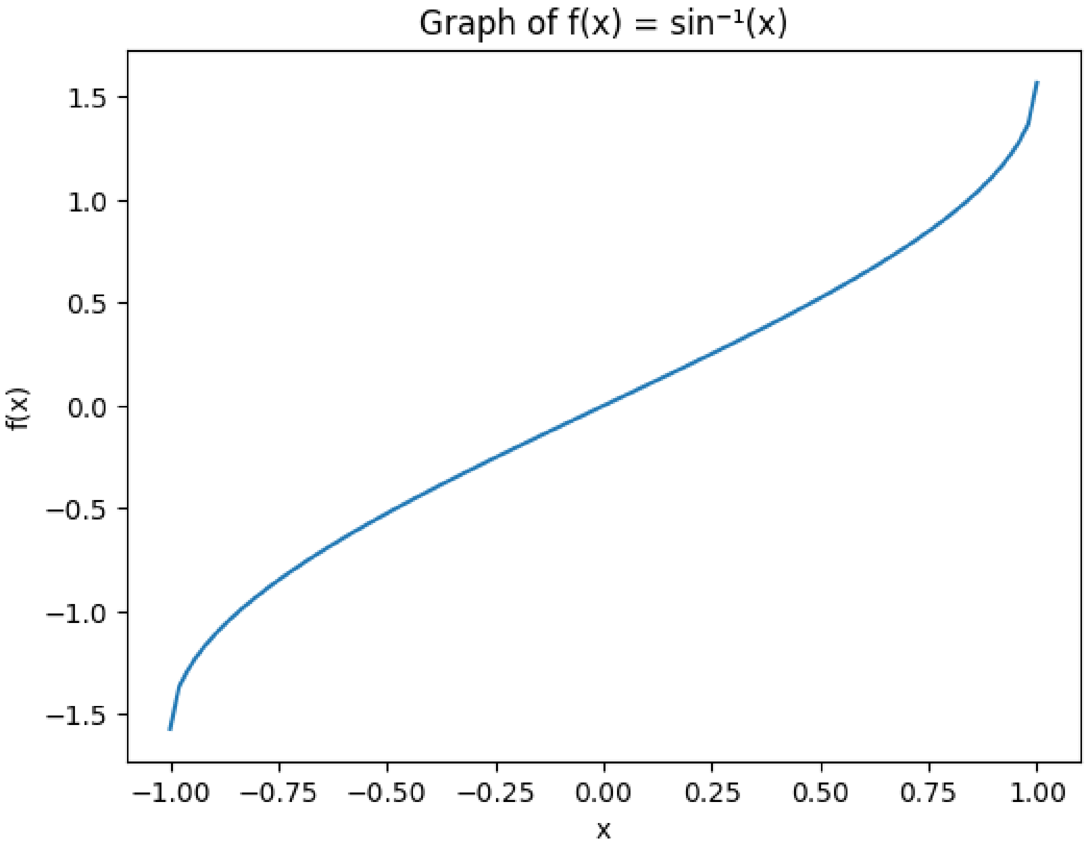
output :



B) Using Python plot the graph of function f(x)=sin^{-1}(x) on the interval [-1,1] -→

```
import numpy as np
import matplotlib.pyplot as plt
def f(x):
    return np.arcsin(x)

x = np.linspace(-1, 1, 100)
y = f(x)
plt.plot(x, y)
plt.xlabel('x')
plt.ylabel('f(x)')
plt.title('Graph of f(x) = sin⁻¹(x)')
plt.show()
```

output :

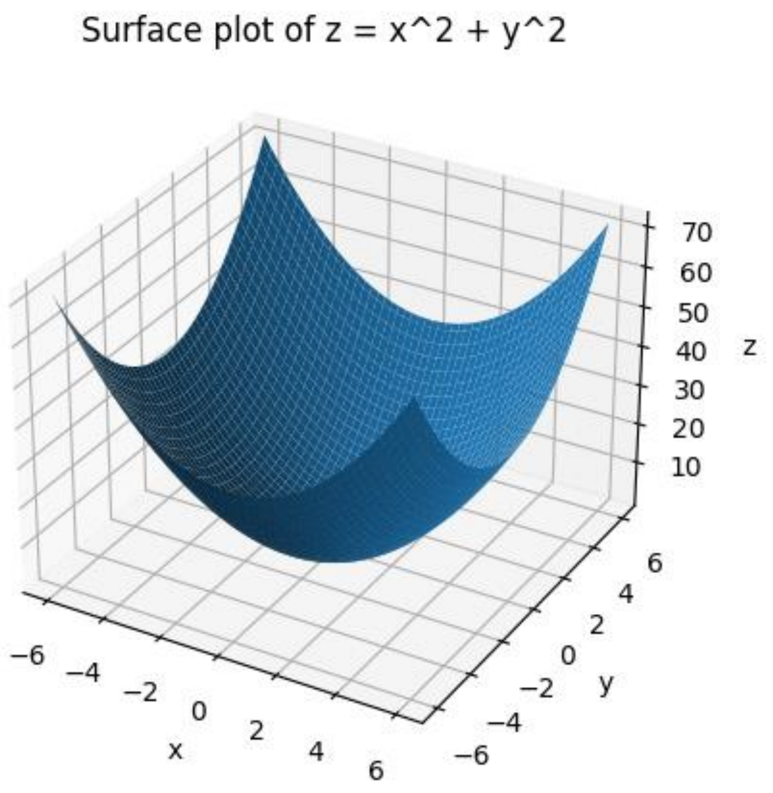


C) Using python plot the surface plot of parabola $z=x^2+y^2$ in $-6<x, y<6$

->

```
 import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
def f(x, y):
    return x**2 + y**2

x = np.linspace(-6, 6, 100)
y = np.linspace(-6, 6, 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 = x^2 + y^2')
plt.show()
```

output :



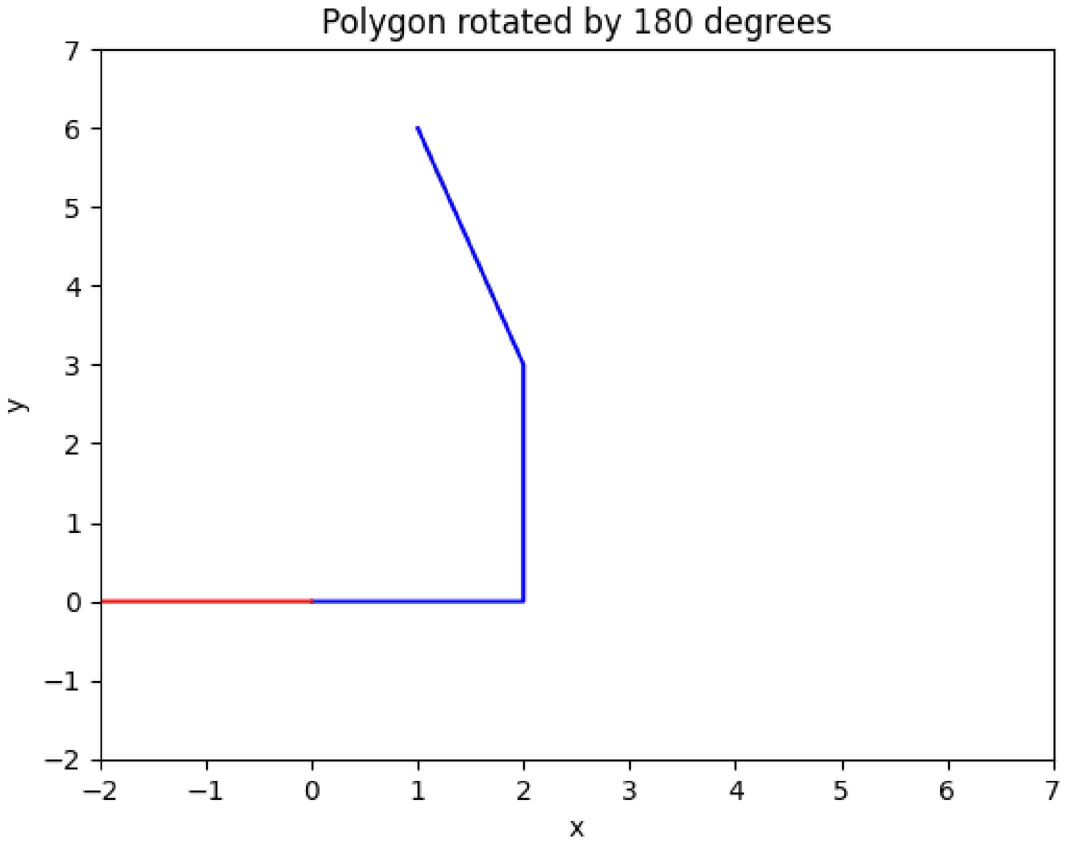
Q2 Attempt any TWO of the following

A . Write a python program to draw a polygon with vertices (0,0),(2,0),(2,3) and (1,6) and rotate it by 180◦

-→

```
import matplotlib.pyplot as plt
import numpy as np
vertices = np.array([(0,0), (2,0), (2,3), (1,6)])
plt.plot(vertices[:,0], vertices[:,1], color='blue')
theta = np.pi
rotation_matrix = np.array([[np.cos(theta), -np.sin(theta)],
                            [np.sin(theta), np.cos(theta)]])
rotated_vertices = vertices.dot(rotation_matrix)
plt.plot(rotated_vertices[:,0], rotated_vertices[:,1], color='red')

plt.xlim([-2, 7])
plt.ylim([-2, 7])
plt.xlabel('x')
plt.ylabel('y')
plt.title('Polygon rotated by 180 degrees')

plt.show()
```

output :

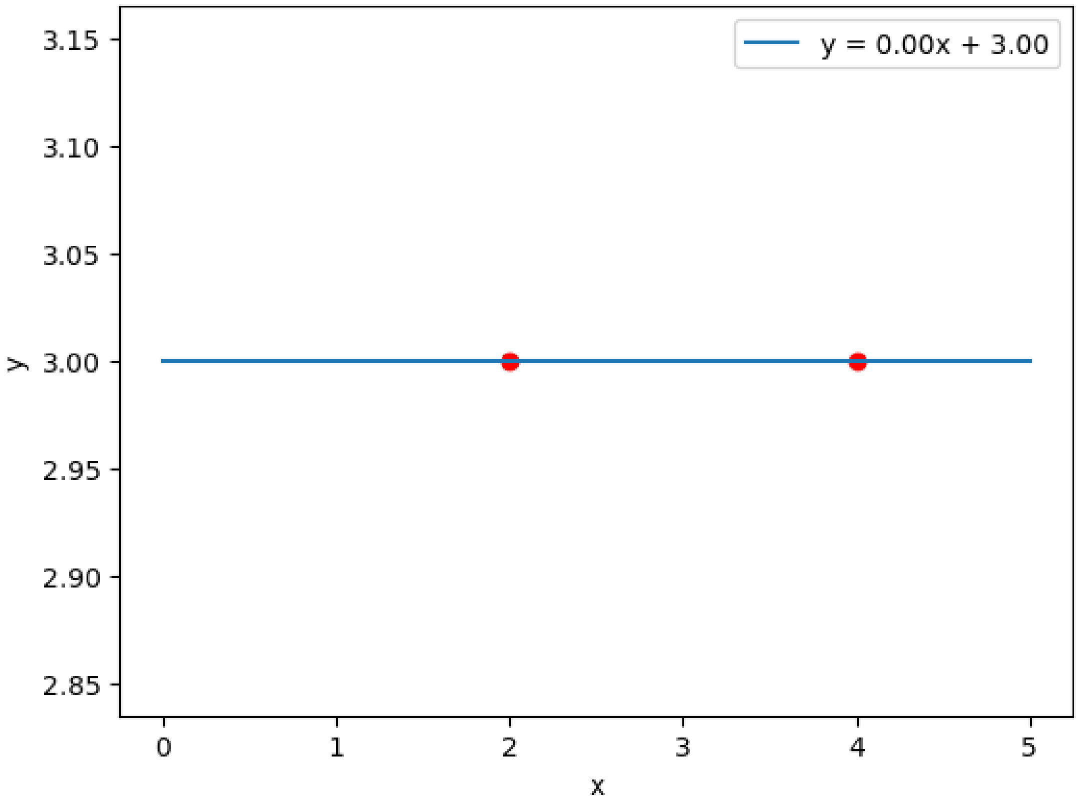


B) Using python generate line passing thorugh points (2,3) and (4,3) and find equation of the line

-→

```
import matplotlib.pyplot as plt
x1, y1 = 2, 3
x2, y2 = 4, 3
slope = (y2 - y1) / (x2 - x1)
y_intercept = y1 - slope * x1

x = [0, 5]
y = [slope * xi + y_intercept for xi in x]
plt.plot(x, y, label=f"y = {slope:.2f}x + {y_intercept:.2f}")
plt.scatter([x1, x2], [y1, y2], color='red')
plt.xlabel("x")
plt.ylabel("y")
plt.legend()
plt.show()
```

output :



Q3) Attempt any ONE of the following

A) Attempt any One of the following

I)Write a pyhon program to solve the following LPP

MAX $Z=150x+75y$
Subject to $4x+6y\leq 24$
$5x+3y\leq 15$
$x,y\geq 0$

→

```
from pulp import *
problem = LpProblem("LP Problem", LpMaximize)
x = LpVariable('x', lowBound=0, cat='Continuous')
y = LpVariable('y', lowBound=0, cat='Continuous')

problem += 150 * x + 75 * y
problem += 4 * x + 6 * y <= 24
problem += 5 * x + 3 * y <= 15
status = problem.solve()

print(f"Status: {LpStatus[status]}")
print(f"x = {value(x):.2f}")
print(f"y = {value(y):.2f}")
print(f"Z = {value(problem.objective):.2f}")
```

II) Write a python 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 $4x+6y-5z+2w\leq -20$
$-8x-3y+3z+2w\leq 20$
$X+y\leq 11$
$X,y,z,w\geq 0$

→

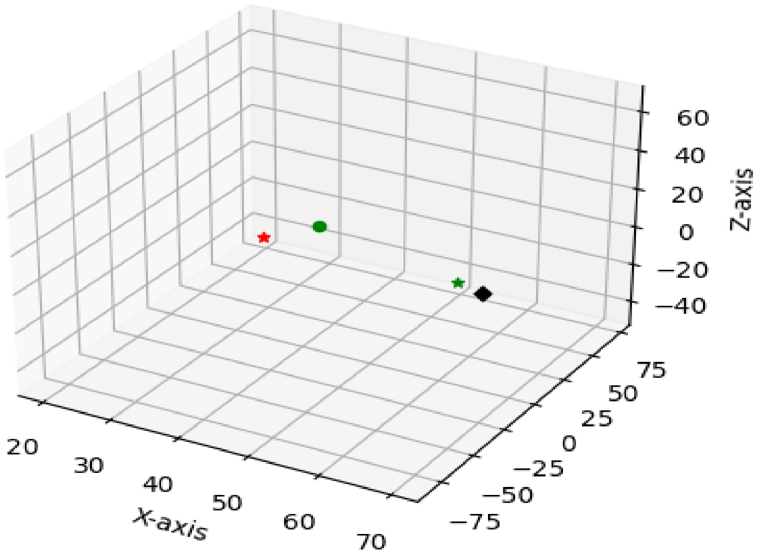
```
from pulp import *
problem = LpProblem("LP Problem", LpMaximize)
x = LpVariable('x', lowBound=0, cat='Continuous')
y = LpVariable('y', lowBound=0, cat='Continuous')
z = LpVariable('z', lowBound=0, cat='Continuous')
w = LpVariable('w', lowBound=0, cat='Continuous')

problem += 4 * x + y + 3 * z + 5 * w
problem += 4 * x + 6 * y - 5 * z + 2 * w <= -20
problem += -8 * x - 3 * y + 3 * z + 2 * w <= 20
problem += x + y <= 11
problem.solve(solvers.PULP_CBC_CMD(msg=0))


print(f"Status: {LpStatus[problem.status]}")
print(f"x = {value(x):.2f}")
print(f"y = {value(y):.2f}")
print(f"z = {value(z):.2f}")
print(f"w = {value(w):.2f}")
print(f"Z = {value(problem.objective):.2f}")
```

b) Attempt any of the following

1) plot 3D axes with labels as X-asix and z-Axis and also plot following points with given coordinates in one graph
I) (70,-25,15) as a diamond in black color
II) (50 , 72, -45) as a * in green color
III) (58,-82,65) as a dot in green color
IV) (20,72,-45) as a * in red color

→

```
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
ax.set_xlabel('X-axis')
ax.set_zlabel('Z-axis')
x1, y1, z1 = 70, -25, 15
x2, y2, z2 = 50, 72, -45
x3, y3, z3 = 58, -82, 65
x4, y4, z4 = 20, 72, -45
ax.scatter(x1, y1, z1, marker='D', c='black')
ax.scatter(x2, y2, z2, marker='*', c='green')
ax.scatter(x3, y3, z3, marker='o', c='green')
ax.scatter(x4, y4, z4, marker='*', c='red')
plt.show()
```

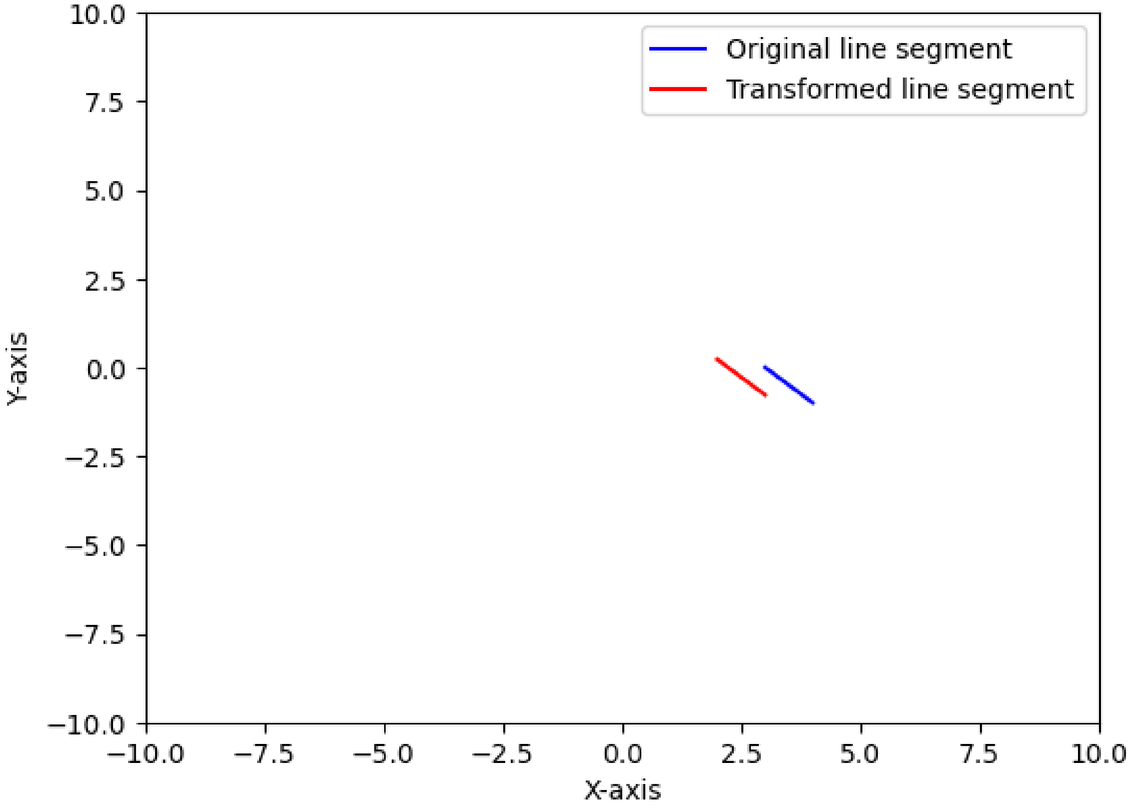


II) Find the combined transformation of the line segment between the points A[4,-1] & B[3,0] by using Python program for the following sequence of transformation

I) Shering in X direction by 9 units
II) Rotation about origin through an angel π
III) Scaling in X-coordinate by 2 units
IV) Reflection through the line y=x

→

```
import numpy as np
import matplotlib.pyplot as plt

A = np.array([4, -1])
B = np.array([3, 0])
T1 = np.array([[1/9, 0], [0, 1]])
T2 = np.array([[-1, 0], [0, -1]])
T3 = np.array([[2, 0], [0, 1]])
T4 = np.array([[0, 1], [1, 0]])

AB = B - A
AB_T1 = T1 @ AB
AB_T2 = T2 @ AB_T1
AB_T3 = T3 @ AB_T2
AB_T4 = T4 @ AB_T3

A_T = A + AB_T4
B_T = B + AB_T4

plt.plot([A[0], B[0]], [A[1], B[1]], 'b', label='Original line segment')
plt.plot([A_T[0], B_T[0]], [A_T[1], B_T[1]], 'r', label='Transformed line segment')

plt.xlim(-10, 10)
plt.ylim(-10, 10)
plt.xlabel('X-axis')
plt.ylabel('Y-axis')

plt.legend()
plt.show()
```



Original line segment
Transformed line segment
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
Y-axis
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
X-axis