

**Write a python code to find the area under the curve for the given function using Trapezoidal and Simpson's rule**

**$Y=\sin(x)$  for  $0 \leq x \leq 1.5707$ .**

```
import numpy as np

x=np.linspace(0,np.pi/2.0,9)

print("x=",x)

y=np.sin(x)

print("y=",y)

h=x[1]-x[0]

print("h=",h)

import matplotlib.pyplot as plt

plt.plot(x,y)

plt.xlabel("x-Angles in Radians")

plt.ylabel("y=sin(x)")

plt.grid()

plt.show()

# Trapezoidal Rule

def trap(y,h):

    n=len(y)

    print("n=",n)

    s=(h/2.0)*(y[0]+y[-1]+2*sum(y[1:-1]))

    return s
```

```

area1=trap(y,h)

print('area1 by trapezoidal rule is ',area1,'\n')

# Simpson,s Rule

def simpson(y,h):

    n=len(y)

    if n%2==1:

        s=(h/3.0)*(y[0]+y[-1]+4*sum(y[1:-1:2])+2*sum(y[2:-2:2]))

    else:

        s=(h/3.0)*(y[0]+y[-2]+4*sum(y[1:-2:2])+2*sum(y[2:-3:2]))

        s=s+(y[-2]+y[-1])*h/2.0

    return s

area2=simpson(y,h)

print("area2 by simpson's rule is=",area2,'\n')

```

## **OUTPUT**

x= [0, 0.19634954, 0.39269908, 0.58904862, 0.78539816  
0.9817477, 1.17809725, 1.37444679, 1.57079633]

y= [0, 0.19509032, 0.38268343, 0.55557023, 0.70710678  
0.83146961, 0.92387953, 0.98078528, 1.]

h= 0.19634954084936207

n= 9

area1 by trapezoidal rule is = 0.9967851718861696

area2 by Simpson's rule is= 1.0000082955239677

