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Subject: QT

PRACTICAL 7

AIM : Numerical solution for integration

1. Simpsons 3/8th rule

Code:

6a.py - C:/Users/user4/Desktop/AryaSyit/QT/6a.py (3.12.2)

File Edit Format Run Options Window Help

```
import math
def f(x):
    return (1/(1+x**2))
def simpsons38(x0,xn,n):
    h=(xn-x0)/n
    res=f(x0)+f(xn)
    for i in range(1,n):
        xi=x0+i*h
        if i%3==0:
            res=res +2 * f(xi)
        else:
            res=res+3*f(xi)

    res=res*3*h/8
    return res
lower_limit=float(input("Enter lower limit of integration:"))
upper_limit=float(input("Enter upper limit of integration:"))
sub_interval=int(input("Enter value for n:"))
result=simpsons38(lower_limit,upper_limit,sub_interval)
print("Result by simpsons 3/8th rule is: %0.4f"%(result))
```

Output:

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```
=============== RESTART: C:/Users/user4/Desktop/AryaSyit/QT/6a.py ====
Enter lower limit of integration:0
Enter upper limit of integration:1
Enter value for n:6
Result by simpsons 3/8th rule is: 0.7854
```

```
= RESTART: C:/Users/user4/Desktop/AryaSyit/QT/6a.py
Enter lower limit of integration:0
Enter upper limit of integration:3
Enter value for n:6
Result by simpsons 3/8th rule is: 1.3888
```

2. Trapezoidal Rule

Code:

6a.py - C:/Users/user4/Desktop/AryaSyit/QT/6a.py (3.12.2)

File Edit Format Run Options Window Help

```
import math
def f(x):
    return (1/(1+x**2))
def trapezoidal(x0,xn,n):
    h=(xn-x0)/n
    res=f(x0)+f(xn)
    for i in range(1,n):
        xi=x0+i*h

        res=res +2 * f(xi)

    res=res*h/2
    return res
lower_limit=float(input("Enter lower limit of integration:"))
upper_limit=float(input("Enter upper limit of integration:"))
sub_interval=int(input("Enter value for n:"))
result=trapezoidal(lower_limit,upper_limit,sub_interval)
print("Result by trapezoidal rule is: %0.4f"%(result))
```

Output:

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```
= RESTART: C:/Users/user4/Desktop/AryaSyit/QT/6a.py
Enter lower limit of integration:0
Enter upper limit of integration:1
Enter value for n:6
Result by trapezoidal rule is: 0.7842
```

3. Direct Integration and find error.

Code:

```
from math import cos,exp,pi
from scipy.integrate import quad
def f(x):
    return 1/(1+x(**2))
#call quad to integrate f from a to b
res,err=quad(f,0,1)
print("Direct numerical integration is:, %0.4f"%(res))
```