Bahria University,

Karachi Campus



LAB EXPERIMENT NO.

**09**

LIST OF TASKS

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| --- | --- |
| TASK NO | OBJECTIVE |
| 1 | **Write a Python program utilizing Simpson's 3/8 Rule to compute the definite integral ∫ ( 𝟏 𝟐 + 𝟐𝟓𝒙 − 𝟐𝟎𝟎𝒙 𝟐 + 𝟔𝟕𝟓𝒙 𝟑 − 𝟗𝟎𝟎𝒙 𝟒 + 𝟒𝟎𝟎𝒙 𝟓 )𝒅𝒙 𝟎.𝟖 𝟎 where n = 3 represents the number of intervals used in the approximation.** |
| 2 | **Write a python program to determine the approximation of the area beneath the curve represented by y = f(x) using Simpson’s 3/8. The values of the function f(x) are provided within following table.** |
| 3 | **Write a python code in table below to determine the integral for this data:** |

Submitted On

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**Task 1: Write a Python program utilizing Simpson's 3/8 Rule to compute the definite integral  
∫ ( 𝟏 𝟐 + 𝟐𝟓𝒙 − 𝟐𝟎𝟎𝒙 𝟐 + 𝟔𝟕𝟓𝒙 𝟑 − 𝟗𝟎𝟎𝒙 𝟒 + 𝟒𝟎𝟎𝒙 𝟓 )𝒅𝒙 𝟎.𝟖 𝟎 where n = 3 represents the number of intervals used in the approximation.**

**Solution:**

def function(x):

  return ( 1 / 2 + 25\*x - 200 \* x\*\*2 + 675\*x\*\*3 - 900\*x\*\*4 + 400\*x\*\*5)

def simpson\_three\_eight\_rule(a,b,n):

  h=(b-a)/n

  Sum=function(a)+function(b)

  for i in range(1,n):

    if i%3 == 0:

      Sum+=2\*function(a+i\*h)

    else:

      Sum+=3\*function(a+i\*h)

  return Sum \*(3\*h/8)

a=0

b=0.8

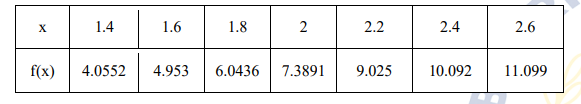
n=3

print('Your value is: ',simpson\_three\_eight\_rule(a,b,n))

**Output**

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**Task 2: Write a python program to determine the approximation of the area beneath the curve represented by y = f(x) using Simpson’s 3/8. The values of the function f(x) are provided within following table.**

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**Solution:**

def simpson\_three\_eight\_rule\_with\_datapoints(datapoints):

  n = len(datapoints) - 1

  h = datapoints[1][0] - datapoints[0][0]

  integral = datapoints[0][1] + datapoints[-1][-1]

  for i in range (1, n):

    if i%3 == 0:

      integral += 2 \* datapoints[i][1]

    else:

      integral += 3 \* datapoints[i][1]

  return integral \* (3\*h/8)

datapoints =[(1.4,4.0552),(1.6,4.953),(1.8,6.0436),(2,7.3891),(2.2,9.025),(2.4,10.092),(2.6,11.099)]

print('Integral : ', simpson\_three\_eight\_rule\_with\_datapoints(datapoints))

**Output**

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**Task 3: Write a python code in table below to determine the integral for this data:**

**A table of numbers with a white background

Description automatically generated**

**Solution:**

def trapeziodal\_rule\_with\_uneven\_segments(data\_points):

  n=len(data\_points)

  integral=0.0

  for i in range(n-1):

    h = data\_points[i+1][0] - data\_points[i][0]

    integral += (1/2) \* h \* (data\_points[i][1] + data\_points[i+1][1])

  return integral

datapoints = [(0.0,0.200000),(0.12,1.309729),(0.22,1.305241),(0.32,1.743393),(0.36,2.074903),(0.40,2.456000),(0.44,2.842985),(0.54,3.507297),(0.64,3.181929),(0.70,2.363000),(0.80,0.232000)]

trapeziodal\_rule\_with\_uneven\_segments(datapoints)

**Output**

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