

**Name: Wasi Mahmood****SID: 10578****NC\_LAB 9**

```
In [ ]: def fx(x):
        return (1/(1+x**2))
```

```
In [ ]: def differenceH(upperLim, LowerLim, intervals):
        loop_cond = True
        H =[0]
        difference = (upperLim - LowerLim )/intervals
        a = difference

        while loop_cond is True:
            H.append(difference)

            difference = difference + a
            #print(difference)

            if (difference / upperLim) > 1:
                loop_cond = False

        return H
```

```
In [ ]: H=[]
        H = differenceH(1,0,5)
        print(H)

[0, 0.2, 0.4, 0.6000000000000001, 0.8, 1.0]
```

```
In [ ]: approx =[]
        for i in range(len(H)):

            approx.append(fx(H[i]))
            print(approx[i])
```

```
1.0
0.9615384615384615
0.8620689655172413
0.7352941176470588
0.6097560975609756
0.5
```

```
In [ ]: (0.2/2)* (((approx[0] + approx[-1]) + (2*sum(approx[1:-1])))) #H == 0.2
```

```
Out[ ]: 0.7837315284527475
```

```
In [ ]: approx[-1]
```

```
Out[ ]: 0.5
```

## Question 2

```
In [ ]: import scipy.integrate as si
import math as m

#ans,err = si.quad(fx,0,1)
#ns
```

Out[ ]: 0.7853981633974484

```
In [ ]: def fx1(t):
return(2000*m.log(140000/ (140000 - 2100*t)) - (9.8*t))
```

```
In [ ]: ans,err = si.quad(fx1,8,30)
ans
```

Out[ ]: 11061.335535080994

```
In [ ]: arr =[]
arr = differenceH(30,8,6)
arr
```

Out[ ]: [0,  
3.6666666666666665,  
7.333333333333333,  
11.0,  
14.666666666666666,  
18.333333333333332,  
22.0,  
25.666666666666668,  
29.333333333333336]

```
In [ ]: arr2 =[]
for i in range(len(arr)):

    arr2.append(fx1(arr[i]))
    print(arr2[i])
```

0.0  
77.20736964345514  
161.20096584523654  
252.84710826256293  
353.1893852636661  
463.500581588258  
585.3551331942507  
720.7326890179049  
872.1703238392176

```
In [ ]: direct_method = (3.63/2)* (((arr2[0] + arr2[-1]) + (2*sum(arr2[1:-1])))) #H == 3.63
```

```
In [ ]: print("By Direct Method: ", direct_method)
print("By Itnegral Mathod: ", ans)
print("Error: ", ans - direct_method)
```

By Direct Method: 11071.929772887843  
By Itnegral Mathod: 11061.335535080994  
Error: -10.594237806848469

## Question 3

```
In [ ]: def fx2(x):  
        return ((300*x) / (1+m.exp(1)**x))
```

```
In [ ]: import scipy.integrate  
ans , err = scipy.integrate.quad(fx2,0,10)  
print("By Itnegral Mathod: ", ans)
```

By Itnegral Mathod: 246.590293505238