

NC_LAB2

Name: Wasi Mahmood SID: 10578

```
In [ ]: x1 = 3
        x2 = 5
        y1 = 36
        y2 = 100
        sloap = (y2 - y1)/(x2 - x1)
        #sloap
```

```
In [ ]: def fx (x):
        return 4*x**2
        #fx(3)
```

```
In [ ]: import sympy as s

        x = s.Symbol('x')
        a=3
        x1 = fx(x)
        #print(x1)
        x2 = fx(a)
        result = s.limit((fx(x)- fx(a))/(x-a), x, a)
        print(result)
```

24

```
In [ ]: def fx1(x):
        return x**3 - 4*x -9
```

```
In [ ]: def midpoint(x,y):

        return((x+y)/2)
        midpoint(-3.375,3)
```

Out[]: -0.1875

```
In [ ]: x=2
        y=3
        for i in range(10):
            #print("x: ",x)
            #print("y: ",y)
            res = midpoint(x,y)
            #print ("midpoint: ",res)

            result = fx1(res)
            #print("function value:" ,result)
            if result < 0:
                x = res
                print("Value of x in ",i," iteration: ",x)
            elif result > 0:
                y = res
                print("Value of y in ",i," iteration: ",y)
```

```
Value of x in 0 iteration: 2.5
Value of y in 1 iteration: 2.75
```

```

Value of x in 2 iteration: 2.625
Value of x in 3 iteration: 2.6875
Value of y in 4 iteration: 2.71875
Value of x in 5 iteration: 2.703125
Value of y in 6 iteration: 2.7109375
Value of y in 7 iteration: 2.70703125
Value of x in 8 iteration: 2.705078125
Value of x in 9 iteration: 2.7060546875

```

```

In [ ]: import math as m
def fx2(x):
    return (m.cos(x)-1.3*x -0)

for i in range(5):
    print(fx2(i))

```

```

1.0
-0.7596976941318603
-3.0161468365471427
-4.8899924966004455
-5.853643620863612

```

```

In [ ]: x= 0
y =1
for i in range(10):
    #print("x: ",x)
    #print("y: ",y)
    res = midpoint(x,y)
    #print ("midpoint: ",res)

    result = fx2(res)
    #print("function value:" ,result)
    if result < 0:
        y = res
        print("Value of y in ",i," iteration: ",x)
    elif result > 0:
        x = res
        print("Value of x in ",i," iteration: ",y)

```

```

Value of x in 0 iteration: 1
Value of y in 1 iteration: 0.5
Value of y in 2 iteration: 0.5
Value of x in 3 iteration: 0.625
Value of x in 4 iteration: 0.625
Value of x in 5 iteration: 0.625
Value of x in 6 iteration: 0.625
Value of x in 7 iteration: 0.625
Value of x in 8 iteration: 0.625
Value of x in 9 iteration: 0.625

```

```

In [ ]: def fx3 (x):
    return(x* m.cos(x) -2*x**2 +3*x -1)

#for i in range(5):
#    print(fx3(i))

```

```

-1.0
0.5403023058681398
-3.8322936730942843
-12.969977489801337
-23.614574483454447

```

```
In [ ]: x= 0
y =1
for i in range(15):
    #print("x: ",x)
    #print("y: ",y)
    res = midpoint(x,y)
    #print ("midpoint: ",res)

    result = fx3(res)
    #print("function value:" ,result)
    if result < 0:
        x = res
        print("Value of y in ",i," iteration: ",x)
    elif result > 0:
        y = res
        print("Value of x in ",i," iteration: ",y)
```

```
Value of x in 0 iteration: 0.5
Value of y in 1 iteration: 0.25
Value of x in 2 iteration: 0.375
Value of x in 3 iteration: 0.3125
Value of y in 4 iteration: 0.28125
Value of y in 5 iteration: 0.296875
Value of x in 6 iteration: 0.3046875
Value of x in 7 iteration: 0.30078125
Value of x in 8 iteration: 0.298828125
Value of x in 9 iteration: 0.2978515625
Value of y in 10 iteration: 0.29736328125
Value of x in 11 iteration: 0.297607421875
Value of y in 12 iteration: 0.2974853515625
Value of x in 13 iteration: 0.29754638671875
Value of y in 14 iteration: 0.297515869140625
```

```
In [ ]: def fx4 (x):
        return(2*x * m.cos(2*x) - (x+1)**2)

        #for i in range(20):
        #    print(fx4(i))

        ##since there is no positive value so we leave this situation here and see it later...
```

```
In [ ]: def fx5(x):
        return(x**3 - 0.165*x**2 +3.993*10**-4)

        #for i in range(-1,20):
        #print(fx5(i))
```

```
In [ ]: x= -1
y =0
for i in range(3):
    print("\n",i,"Iteration")
    #print("x: ",x)
    #print("y: ",y)
    res = midpoint(x,y)
    print ("midpoint: ",res)

    result = fx3(res)
```

```
print("function value:" ,result)
if result < 0:
    x = res
    print("Value of x in ",i," iteration: ",x)
elif result > 0:
    y = res
    print("Value of y in ",i," iteration: ",y)
```

#print("Error: ", x - y)# wrong method of error check the notebook for solution

```
0 Iteration
midpoint: -0.5
function value: -3.4387912809451864
Value of x in 0 iteration: -0.5

1 Iteration
midpoint: -0.25
function value: -2.117228105427661
Value of x in 1 iteration: -0.25

2 Iteration
midpoint: -0.125
function value: -1.530274708403666
Value of x in 2 iteration: -0.125
```