NC Lab # 06

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Task # 01

Code:

```
#cos(x)-1.3(x)-0
import math as m
import sympy as s
def f(x):
    return m.cos(x)-1.3*x
def mullersmethod(x0,x1,x2):
    for i in range (4):
        d1=f(x0)-f(x2)
        d2=f(x1)-f(x2)
        c=f(x1)
        h1=x0-x2
        h2=x1-x2
        a=((h1*d2)-(h2*d1))/((h1*h2)*(x1-x0))
        b=((h1**2)*d2-(h2**2)*d1)/((x0-x1)*(h2*h1))
        if(b>0):
            xr=x1-(2*c)/(b+m.sqrt(b**2-4*a*c))
        else:
            xr=x1-(2*c)/(b-m.sqrt(b**2-4*a*c))
        if(x1>xr):
            x2=x1
            x1=xr
            tolr=abs(x2-x1)
            print("Iterations: ",i, "\t root : ",xr, "\t\t Tolerance : ",tolr)
```

```
        else:
            x0=x1
            x1=xr
            tolr=abs(x1-x0)
            print("Iterations: ",i, "\t root : ",xr, "\t\t Tolerance : ",tolr)


x0=0
x1=0.5
x2=1


mullersmethod(x0,x1,x2)
```

Output:

```
Iterations:  0   root :  0.6019080022483525            Tolerance :  0.1019080022483525
Iterations:  1   root :  0.6211430759307924            Tolerance :  0.01923507368243993
Iterations:  2   root :  0.6237941914168754            Tolerance :  0.002651115486082989
Iterations:  3   root :  0.6241349409321936            Tolerance :  0.00034074951531815056
```

Task # 02

Code:

```
#xcos(x)-2x^2+3x-1=0
import math as m
import sympy as s
def f(x):
    return x*m.cos(x)-2*x**2+3*x-1
def mullersmethod(x0,x1,x2):
    for i in range (8):
        d1=f(x0)-f(x2)
        d2=f(x1)-f(x2)
        c=f(x1)
        h1=x0-x2
```

```
    h2=x1-x2
    a=((h1*d2)-(h2*d1))/((h1*h2)*(x1-x0))
    b=((h1**2)*d2-(h2**2)*d1)/((x0-x1)*(h2*h1))
    if(b>0):
        xr=x1-(2*c)/(b+m.sqrt(b**2-4*a*c))

    else:
        xr=x1-(2*c)/(b-m.sqrt(b**2-4*a*c))

    if(x1>xr):
        x2=x1
        x1=xr
        tolr=abs(x2-x1)
        print("Iterations: ",i, "\t root : ",xr, "\t\t Tolerance : ",tolr)
    else:
        x0=x1
        x1=xr
        tolr=abs(x1-x0)
        print("Iterations: ",i, "\t root : ",xr, "\t\t Tolerance : ",tolr)
x0=0
x1=0.5
x2=1
mullersmethod(x0,x1,x2)
```

Output:

```
Iterations:  0   root :  0.7451462162798443          Tolerance :  0.24514621627984434
Iterations:  1   root :  1.0537826526854375          Tolerance :  0.30863643640559313
Iterations:  2   root :  1.2833243084905694          Tolerance :  0.22954165580513197
Iterations:  3   root :  1.2081266649051827          Tolerance :  0.07519764358538672
Iterations:  4   root :  1.2498012880479523          Tolerance :  0.041674623142769596
Iterations:  5   root :  1.2561625082338026          Tolerance :  0.00636122018585028
Iterations:  6   root :  1.2565977958144998          Tolerance :  0.00043528758069721896
Iterations:  7   root :  1.2566219299942587          Tolerance :  2.4134179758883434e-05
```