Maths lab ☆

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```
[35] #Computational Mathematics(22BS1MA02)
     #Python Lab Experiments Assignment
     #TERM-1
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     #JUUG22BTECH30058
     #AIML-Sec A
```

```
#Exp-1(1)
A={1,2,3,4,5,6}
B={"Hari", "Prem", 102.55, 23, 12}
print(A)
print(B)
```

```
{1, 2, 3, 4, 5, 6}
{'Prem', 102.55, 'Hari', 12, 23}
```

```
[4] #Exp-1(2)
    A=frozenset(A)
    B=frozenset(B)
    print((A|B)-(A&B))
```

```
frozenset({1, 2, 3, 4, 5, 6, 'Prem', 102.55, 'Hari', 12, 23})
```

```
[5] #Exp-1(3)
    A={2,3,5,7,11,13}
    B={1,3,5,7,9,11,13}
    print(A-B)
```

```
{2}
```

```
[7] #Exp-1(4)
    A=set()
    B=set()
    for i in range(10):
      if i%2==0:
        A.add(i)
      if i%3==0:
        B.add(i)
    C=((A|B)-(A&B))
    print(C)
```

```
{2, 3, 4, 8, 9}
```

```
[15] #Exp-2(1(i))
     from sympy.logic.boolalg import And,Not
     def compound_prop(p,q):
       return And(p,And((q),Not(p)))
     print("p    q     ans")
     for p in [True,False]:
       for q in [True,False]:
         ans=compound_prop(p,q)
         print(p,q,ans)
```

```
p    q     ans
True True False
True False False
False True False
False False False
```

```
[16] #Exp-2(1(ii))
     from sympy.logic.boolalg import Or,Implies
     def compound_prop(p,q,r):
       return Implies(Or(p,q),r)
     print("p     q     r     ans")
```

```
for p in [True,False]:
  for q in [True,False]:
    for r in [True,False]:
      ans=compound_prop(p,q,r)
      print(p,q,r,ans)
```

```
p     q     r    ans
True True True True
True True False False
True False True True
True False False False
False True True True
False True False False
False False True True
False False False True
```

[18]
```
#Exp-2(2)
from sympy.logic.boolalg import Implies,And
def compound_prop(p,q,r):
  return Implies(And(Implies(p,q),Implies(q,r)),Implies(p,r))
print("p     q     r    ans")
for p in [True,False]:
  for q in [True,False]:
    for r in [True,False]:
      ans=compound_prop(p,q,r)
      print(p,q,r,ans)
```

```
p     q     r    ans
True True True True
True True False True
True False True True
True False False True
False True True True
False True False True
False False True True
False False False True
```

0s
```
#Exp-3(1(i))
from sympy import symbols,diff
x,y=symbols('x y',real=True)
f=x**5+3*(x**3)*(y**2)+3*x*y**4
derivative_f=f.diff(x)
derivative_f
```

$$5x^4 + 9x^2y^2 + 3y^4$$

[22] 0s
```
#Exp-3(1(ii))
from sympy import symbols,diff,sin
x,y=symbols('x y',real=True)
f=sin(x/(1+y))
derivative_f=f.diff(x)
derivative_f
```

$$\frac{\cos\left(\frac{x}{y+1}\right)}{y+1}$$

[25] 0s
```
#Exp-3(2(i))
from sympy import *
import sympy as sm
x,y=sm.symbols('x y',real=True)
f1=derivative_f
derivative_f1=f1.diff(x)
derivative_f1
```

$$-\frac{\sin\left(\frac{x}{y+1}\right)}{(y+1)^2}$$

[26] 0s
```
#Exp-3(2(ii))
from sympy import *
import sympy as sm
x,y=symbols('x y',real=True)
f=sqrt(x**2+y**2)
```

```
derivative_f=f.diff(x)
derivative_f
```

$$\frac{x}{\sqrt{x^2+y^2}}$$

[27]
```
from sympy import *
import sympy as sm
x,y=symbols('x y',real=True)
f2=derivative_f
derivative_f2=f2.diff(x)
derivative_f2
```

$$-\frac{x^2}{(x^2+y^2)^{\frac{3}{2}}}+\frac{1}{\sqrt{x^2+y^2}}$$

[28]
```
#Exp-4(1)
import numpy as np
from numpy.linalg import eig
a=np.array([[2,4],[1,-3]])
w,v=eig(a)
print(w)
print(v)
```

```
[ 2.70156212 -3.70156212]
[[ 0.98496508 -0.57432028]
 [ 0.17275355  0.81863069]]
```

[29]
```
#Exp-4(2)
import numpy as np
from numpy.linalg import eig
a=np.array([[8,-6,2],[-6,7,-4],[2,-4,3]])
w,v=eig(a)
print(w)
print(v)
```

```
[1.50000000e+01 3.00000000e+00 9.87364928e-17]
[[-0.66666667  0.66666667  0.33333333]
 [ 0.66666667  0.33333333  0.66666667]
 [-0.33333333 -0.66666667  0.66666667]]
```

[30]
```
#Exp-5(1(i))
from sympy import Symbol,Function,Derivative,Eq,dsolve,solve
x=Symbol("x")
y=Function('y')(x)
deq=Eq(Derivative(y,x,x)-5*Derivative(y,x,x)+7*Derivative(y,x)-3*y,0)
s=dsolve(deq)
s
```

$$y(x)=C_1e^{\frac{3x}{4}}+C_2e^{x}$$

[32]
```
#Exp-5(1(ii))
from sympy import Symbol,Function,Derivative,Eq,dsolve,solve
x=Symbol("x")
y=Function('y')(x)
deq=Eq(Derivative(y,x,x,x,x)-18*Derivative(y,x,x)+18*y,36*exp(x)+8*x)
s=dsolve(deq)
s
```

$$y(x)=C_1e^{-\sqrt{3}x\sqrt{3-\sqrt{7}}}+C_2e^{\sqrt{3}x\sqrt{3-\sqrt{7}}}+C_3e^{-\sqrt{3}x\sqrt{\sqrt{7}+3}}+C_4e^{\sqrt{3}x\sqrt{\sqrt{7}+3}}+\frac{4x}{9}+36e^{x}$$

[33]
```
#Exp-5(2)
from sympy import Symbol,Function,Derivative,Eq,dsolve,solve
from sympy.plotting import plot
x=Symbol("x")
y=Function('y')(x)
deq=Eq(Derivative(y,x,x)-Derivative(y,x),x**2-2*x-32)
s=dsolve(deq)
eqn1=s.rhs.subs(x,0)-1
eqn2=s.rhs.diff(x).subs(x,0)-(-1)
constants=solve([eqn1,eqn2])
```

```
sol=s.subs(constants)
sol
```

$$y(x) = -\frac{x^3}{3} + 32x - 33e^x + 34$$

```
[ ]
```