LAB ASSIGNMENT – 3

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COURSE CODE	MAT2002
COURSE NAME	APPLICATIONS OF DIFFERENTIAL AND DIFFERENCE EQUATIONS
SLOT	L1+L2
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EXPERIMENT 3(A)

SOLUTION OF LINEAR DIFFERENTIAL EQUATIONS BY METHOD OF VARIATION OF PARAMETERS.

MATLAB CODE:

```
clear all
close all
clc
syms c1 c2 x m
F=input('Enter the coefficients [a,b,c]: ');
f=input('Enter the RHS function f(x): ');
a=F(1);b=F(2);c=F(3);
AE=a*m^2+b*m+c;
m=solve(AE);
m1=m(1); m2=m(2);
D=b^2-4*a*c;
if(D>0)
    y1=exp(m1*x);y2=exp(m2*x);
elseif (D==0)
    y1=exp(m1*x);y2=x*exp(m1*x);
else
    alfa=real(m1);beta=imag(m1);
    y1=exp(alfa*x)*cos(beta*x);
    y2=exp(alfa*x)*sin(beta*x);
end
yc=c1*y1+c2*y2;
fx=f/a;
W=y1*diff(y2,x)-y2*diff(y1,x);
u=int(-y2*fx/W,x);
v=int(y1*fx/W,x);
yp=y1*u+y2*v;
y_gen=yc+yp;
check=input('If the problem has initial conditions then enter 1 else enter 2: ')
if(check==1)
    cn=input('Enter the initial conditions [x0, y(x0), Dy(x0)]:');
    dy_gen=diff(y_gen);
    eq1=(subs(y_gen,x,cn(1))-cn(2));
    eq2=(subs(dy_gen,x,cn(1))-cn(3));
    [c1 c2]=solve(eq1,eq2);
    y=simplify(subs(y_gen));
    disp('The complete solution is');
    disp(y);
    ezplot(y, [cn(1),cn(1)+2]);
else
    y=simplify(y_gen);
    disp('The General Solution is ');
    disp(y);
end
```

Q.1

Find the general solution of the differential equation $y'' + y = \sec x \tan x$.

INPUT:

```
Enter the coefficients [a,b,c]: [1 0 1]
Enter the RHS function f(x): sec(x)*tan(x)
If the problem has initial conditions then enter 1 else enter 2: 2
```

OUTPUT:

```
The General Solution is
(log(tan(x)^2 + 1)*sin(x))/2 - sin(x) + c1*cos(x) - c2*sin(x) + x*cos(x)
```

Q.2 Suppose that a spring with a mass of 2 kg. has natural length 0.5 m. A force of 25.6 N is required to maintain it stretched to a length of 0.2 m. The spring is immersed in a fluid with damping constant c=40. Find the position of the mass at any time t if it starts from the equilibrium position and is given a push to start with an initial velocity of 0.6 m/s.

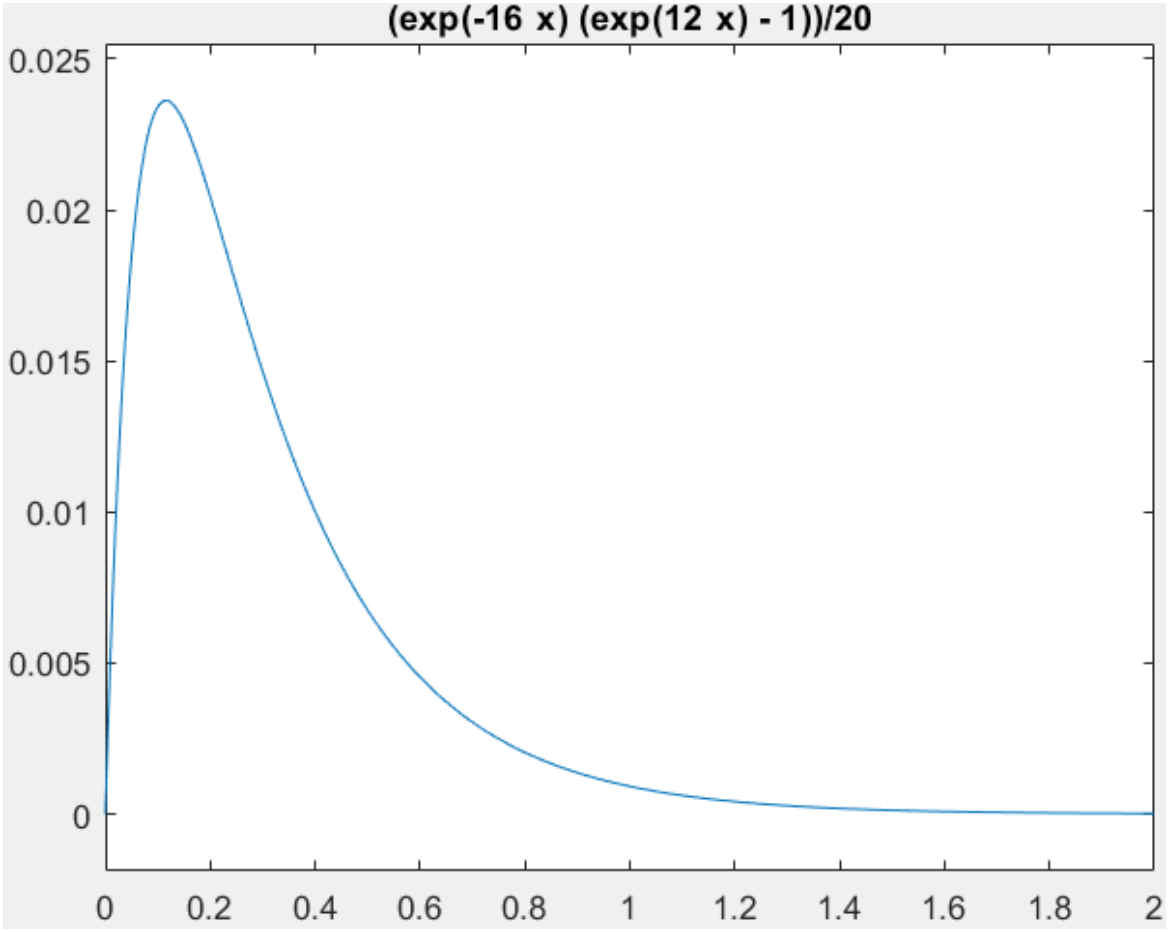
INPUT (2):

```
Enter the coefficients [a,b,c]: [1 20 64]
Enter the RHS function f(x): 0
If the problem has initial conditions then enter 1 else enter 2: 1
Enter the initial conditions [x0, y(x0), Dy(x0)]:[0 0 0.6]
```

OUTPUT (2):

```
The complete solution is
(exp(-16*x)*(exp(12*x) - 1))/20
```

FIGURE:


(exp(-16 x) (exp(12 x) - 1))/20
0.025
0.02
0.015
0.01
0.005
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

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