212 Lab #8 Key

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>> syms x y t s
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1.
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>> syms x y t s Y
>> eqn1=sym(['D(D(y))(t)+4*y(t)=sin(t)*heaviside(t-2*pi)'])
```

eqn1 =

D(D(y))(t) + 4*y(t) == sin(t)*heaviside(t - 2*pi)

```
>> lteqn1=laplace(eqn1,t,s);
>>
neweqn1=subs(lteqn1,{'laplace(y(t),t,s)','y(0)','D(y)(0)'},{Y,1,0});
>> Ytrans1=simplify(solve(neweqn1,Y));
>> y=ilaplace(Ytrans1,s,t)
```

y =

cos(2*t) - heaviside(t - 2*pi)*(sin(2*t)/6 - sin(t)/3)

```
>> ezplot(y,[0,12])
>>
```


2.
```
>> eqn2=sym(['D(y)(t)+2*y(t)=t-t*heaviside(t-1)'])
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eqn2 =

D(y)(t) + 2*y(t) == t - t*heaviside(t - 1)

```
>> lteqn2=laplace(eqn2,t,s);
>> neweqn2=subs(lteqn2,{'laplace(y(t),t,s)','y(0)'},{Y,0});
>> Ytrans2=simplify(solve(neweqn2,Y));
>> y=ilaplace(Ytrans2,s,t)
```
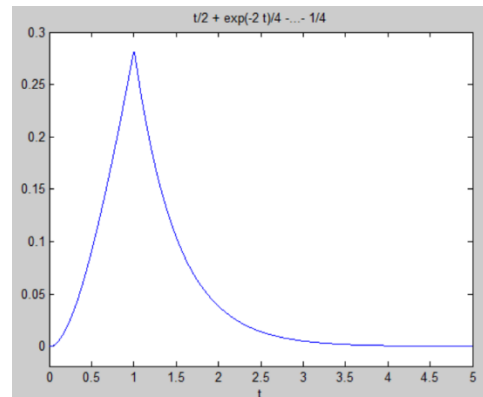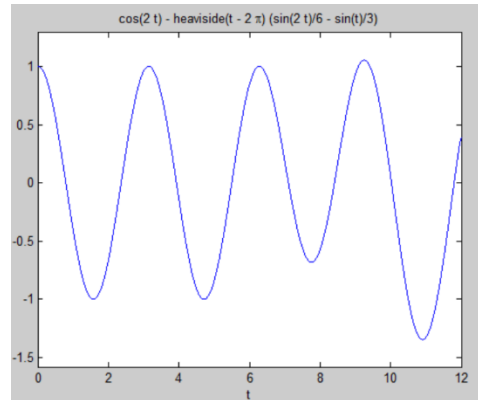
y =

t/2 + exp(-2*t)/4 - heaviside(t - 1)*(t/2 + exp(2 - 2*t)/4 - 3/4) + heaviside(t - 1)*(exp(2 - 2*t)/2 - 1/2) - 1/4


```
>> ezplot(y,[0,5])
```

3.
```
>> eqn3=sym(['D(D(y))(t)-4*D(y)(t)+4*y(t)=dirac(t-3)'])
```

eqn3 =

D(D(y))(t) - 4*D(y)(t) + 4*y(t) == dirac(t - 3)

```
>> lteqn3=laplace(eqn3,t,s);
>>
neweqn3=subs(lteqn3,{'laplace(y(t),t,s)','y(0)','D(y)(0)'},{Y,0,0});
>> Ytrans3=simplify(solve(neweqn3,Y));
>> y=ilaplace(Ytrans3,s,t)

y =

heaviside(t - 3)*exp(2*t - 6)*(t - 3)

>> ezplot(y,[0,5])
>>
```


heaviside(t - 3) exp(2 t - 6) (t - 3)

4.
```
>> eqn4=sym(['D(D(y))(t)+5*D(y)(t)+8*y(t)=(t-1)*heaviside(t-
1)+(3*t+1)*heaviside(t-2)'])

eqn4 =

5*D(y)(t) + D(D(y))(t) + 8*y(t) == heaviside(t - 1)*(t - 1) +
heaviside(t - 2)*(3*t + 1)

>> lteqn4=laplace(eqn4,t,s);
>>
```


5 exp(5/2 - (5 t)/2) (cos((7^{1/2} (t - 1))/2) + (9 7^{1/2} sin((7^{1/2} (t - 1))/2))/35)/64 - 13/64) -...+ (12 7^{1/2} ex

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neweqn4=subs(lteqn4,{'laplace(y(t),t,s)','y(0)','D(y)(0)'},{Y,1,1});
>> Ytrans4=simplify(solve(neweqn4,Y));
>> y=ilaplace(Ytrans4,s,t)

y =

heaviside(t - 1)*(t/8 + (5*exp(5/2 - (5*t)/2)*(cos((7^(1/2)*(t - 1))/2) + (9*7^(1/2)*sin((7^(1/2)*(t -
1))/2))/35))/64 - 13/64) - 7*heaviside(t - 2)*((exp(5 - (5*t)/2)*(cos((7^(1/2)*(t - 2))/2) +
(5*7^(1/2)*sin((7^(1/2)*(t - 2))/2))/7))/8 - 1/8) + 3*heaviside(t - 2)*(t/8 + (5*exp(5 -
(5*t)/2)*(cos((7^(1/2)*(t - 2))/2) + (9*7^(1/2)*sin((7^(1/2)*(t - 2))/2))/35))/64 - 21/64) + exp(-
(5*t)/2)*(cos((7^(1/2)*t)/2) - (5*7^(1/2)*sin((7^(1/2)*t)/2))/7) + (12*7^(1/2)*exp(-
(5*t)/2)*sin((7^(1/2)*t)/2))/7

>> ezplot(y,[0,5])
>>
```
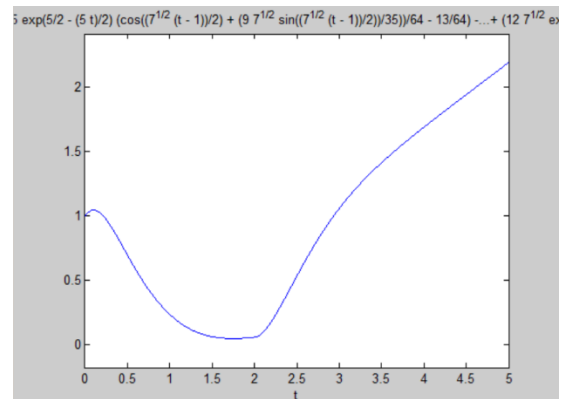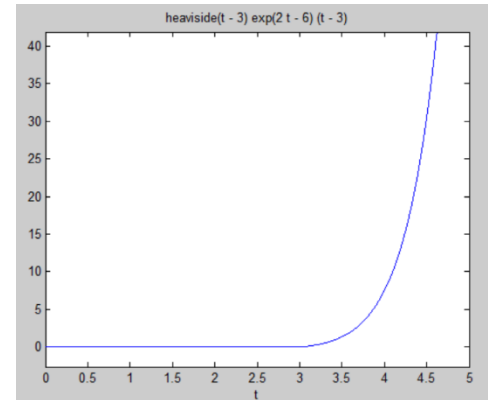
5.
```
>> eqn5=sym(['D(D(y))(t)+3*D(y)(t)+6*y(t)=sin(t)*heaviside(t-pi/2)+dirac(t-pi)'])

eqn5 =

3*D(y)(t) + D(D(y))(t) + 6*y(t) == dirac(t - pi) + sin(t)*heaviside(t - pi/2)

>> lteqn5=laplace(eqn5,t,s);
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```
>> neweqn5=subs(lteqn5,{'laplace(y(t),t,s)','y(0)','D(y)(0)'},{Y,0,2});
>> Ytrans5=simplify(solve(neweqn5,Y));
>> y=ilaplace(Ytrans5,s,t)

y =

heaviside(t - pi/2)*((5*cos(t - pi/2))/34 + (3*sin(t -
pi/2))/34 - (5*exp((3*pi)/4 - (3*t)/2)*(cos((15^(1/2)*(pi/2
- t))/2) - (7*15^(1/2)*sin((15^(1/2)*(pi/2 - t))/2))/25))/34)
+ (4*15^(1/2)*exp(-(3*t)/2)*sin((15^(1/2)*t)/2))/15 -
(2*15^(1/2)*exp((3*pi)/2 - (3*t)/2)*sin((15^(1/2)*(pi -
t))/2)*heaviside(t - pi))/15

>> ezplot(y,[0,12])
>>
```


(5 exp((3 π)/4 - (3 t)/2) (cos((15$^{1/2}$ (π/2 - t))/2) - (7 15$^{1/2}$ sin((15$^{1/2}$ (π/2 - t))/2))/25))/34) +...- (2 15$^{1/2}$