Lab - 1

Instructions:

1. Please plot so that we are able to understand, i.e., with legends, axis labels, titles etc.
2. Observations pertaining to each plot is expected below the same.
3. Kindly number your answers correctly.
4. **NO PLAGIARISM.**
5. Ask any questions in class or via LMS so that it will be beneficial to all (us and you).

Questions:

MATLAB Exploration:

1 (a) Write a Matlab function *signalx* that evaluates the following signal at an arbitrary set of points:

$$x(t) = \begin{cases} 2e^{t+2}, & -3 \le t \le -1 \\ 2e^{-t}\cos 2\pi t, & -1 \le t \le 4 \\ 0, & \text{else} \end{cases}$$

That is, given an input vector of time points, the function should give an output vector with the values of x evaluated at those time points. For time points falling outside $[-3, 4]$, the function should return the value zero.
(b) Use the function *signalx* to plot $x(t)$ versus t, for $-6 \le t \le 6$. To do this, create a vector of sampling times spaced closely enough to get a smooth plot. Generate a corresponding vector using *signalx*. Then plot one against the other.
(c) Use the function *signalx* to plot $x(t-3)$ versus t.
(d) Use the function *signalx* to plot $x(3-t)$ versus t.
(e) Use the function *signalx* to plot $x(2t)$ versus t.

Convolution

2(a) Write a Matlab function contconv that computes an approximation to continuous-time convolution as follows.

Inputs: Vectors x1 and x2 representing samples of two signals to be convolved. Scalars t1, t2 and dt, representing the starting time for the samples of x1 , the starting time for the samples in x2 , and the spacing of the samples.

Outputs: Vectors y and t, corresponding to the samples of the convolution output and the sampling times.

(b) Check that your function works by using it to convolve two boxes, $3I_{[-2,-1]}$ and $4I_{[1,3]}$, to get a trapezoid (The below code fragment should assist in doing this).

Plot all the three signals (i.e., x1, x2, y) in the same plot (subplot).

```
dt=0.01;%sample spacing
s1 = -2:dt:-1; %sampling times over the interval [-2,-1]
s2= 1:dt:3; %sampling times over the interval [1,3]
x1=3*ones(length(s1),1); %samples for first box
```

```
x2=4*ones(length(s2),1); %samples for second box
[y,t]= contconv(x1,x2,s1(1),s2(1),dt);
figure(1);
plot(t,y);
```

(c) Convolve the same box twice, $I_{[-2,-1]}$. Plot the two signals (i.e., x1, y) in the same plot.