# Principles of Communication Systems Lab
## Lab 1
## Due: August 18th, 2017

1. Install Matlab/Octave on your machine.
2. Get familiar with basic file operations.
3. Each lab report must be submitted on LMS by the deadline.
4. Lab report should include your name, roll number, title of the lab on the first page.

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 $\mathbf{x}_1$ and $\mathbf{x}_2$ representing samples of two signals to be convolved. Scalars $t_1$, $t_2$ and $dt$, representing the starting time for the samples of $\mathbf{x}_1$, the starting time for the samples in $\mathbf{x}_2$, and the spacing of the samples.
**Outputs:** Vectors $\mathbf{y}$ and $\mathbf{t}$, 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 (e.g., using the following code fragment):

```
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]
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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);
```