KATHMANDU UNIVERSITY

DHULIKHEL, KAVRE

Subject: COMP-407: Digital Signal Processing

Lab no: 2

Submitted By:

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Group: CE 4th year 1st sem
Level: UNG

Submitted To:

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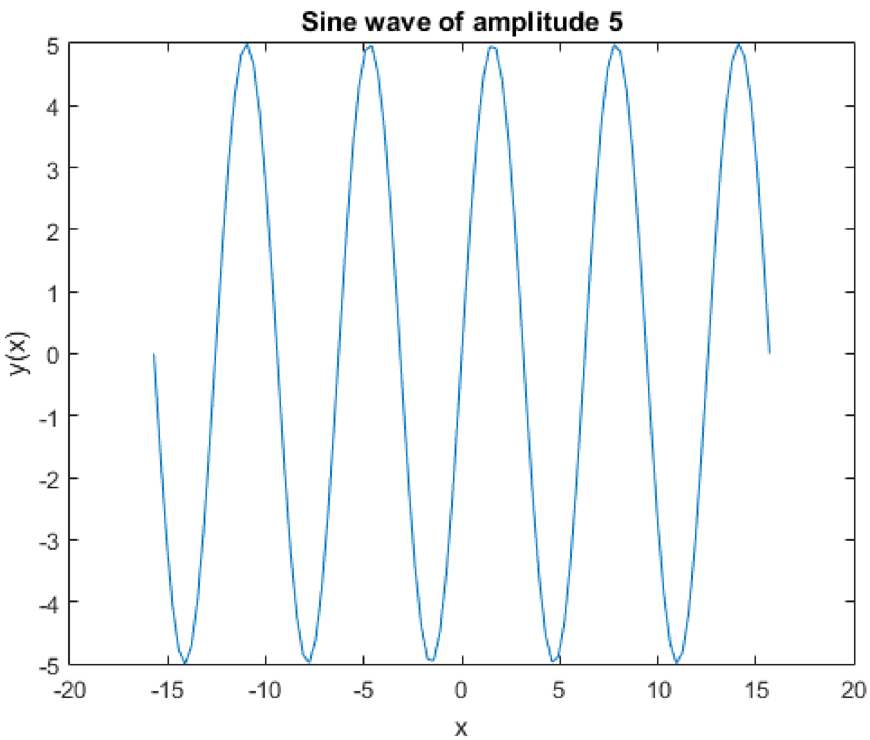
1. Generate a continuous time sinusoidal wave of amplitude 5.

```
x = linspace(-5*pi,5*pi);   %range of x
y1 = 5*sin(x);
plot(x,y1);
title('Sine wave of amplitude 5');
xlabel('x');
ylabel('y(x)');
```



2. Generate a unit impulse function.

Theory:

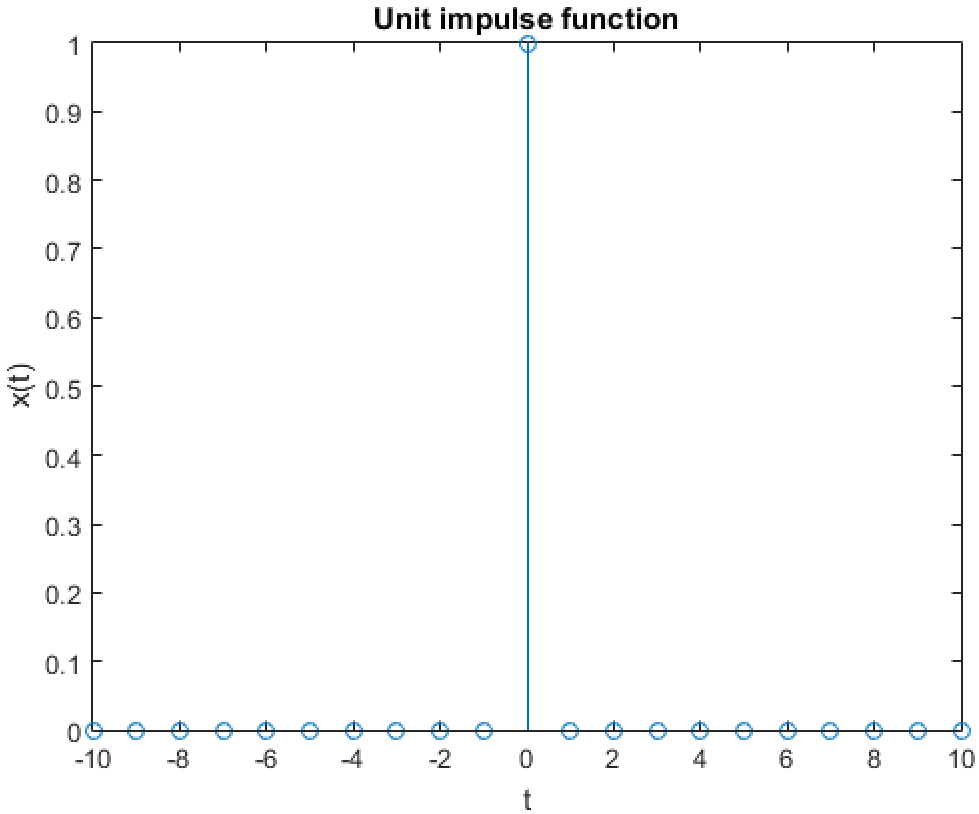
The unit impulse sequence is “a sequence of discrete samples having unit magnitude at origin and zero magnitude at all other sample instants”.

$$\delta[n] = \begin{cases} 1 & \text{at } n = 0 \\ 0 & \text{at } n \neq 0 \end{cases}$$

Code:

```
t = [-10:10];   %range of t
impulse = t==0; %impulse function
figure;
stem(t,impulse);
title('Unit impulse function')
xlabel('t');
ylabel('x(t)');
```

Output:



3. Generate a unit step function.

Theory

The unit step function, is defined as

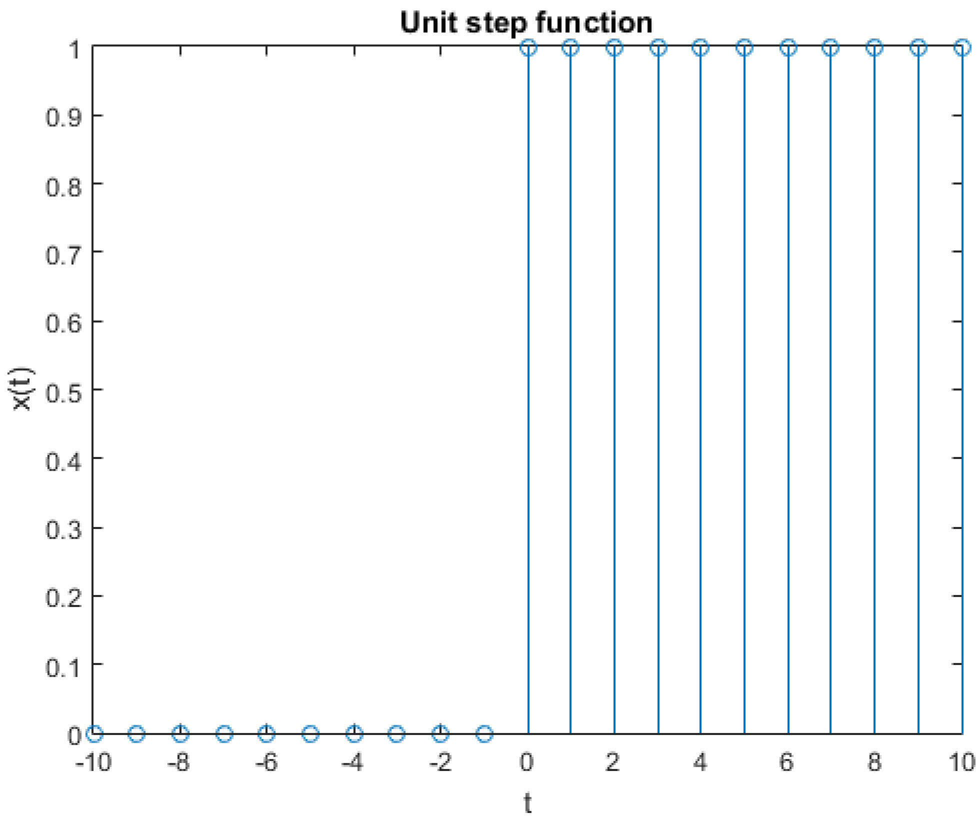
$$u(t) = \begin{cases} 0 & t < 0 \\ 1 & t > 0 \end{cases}$$

i.e., u is a function of time t, and u has value zero when time is negative; and value one when time is positive or zero.

Code:

```
unitstep = t>=0;    %unit step function
figure;
stem(t,unitstep);
title('Unit step function')
xlabel('t');
ylabel('x(t)');
```

Output:



4. Generate a unit ramp function.

Theory

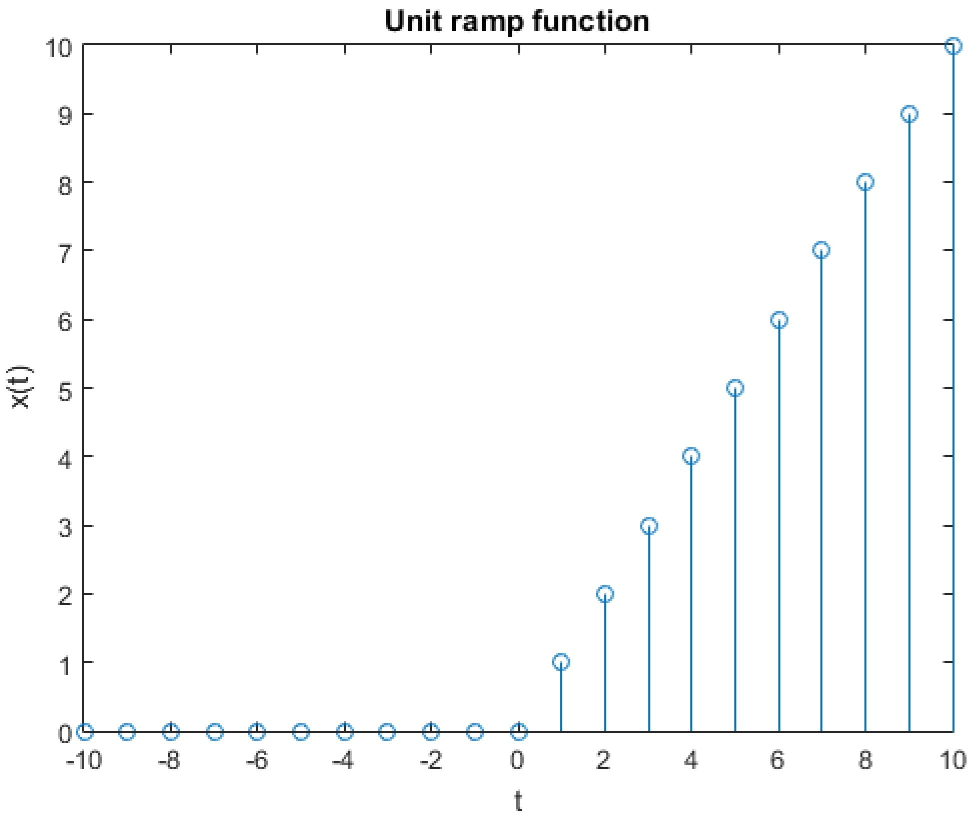
A signal whose magnitude increases same as time. It can be obtained by integrating unit step. Its graph is shaped like a ramp. Its value is 0 for negative inputs, output equals input for non-negative inputs.

$$r(t) = \begin{cases} t & \text{for } t \geqslant 0 \\ 0 & \text{for } t < 0 \end{cases}$$

Code:

```
ramp = t.*unitstep; %ramp function
figure;
stem(t,ramp);
title('Unit ramp function')
xlabel('t');
ylabel('x(t)');
```

Output:



5. Generate a continuous time sinc function

Theory

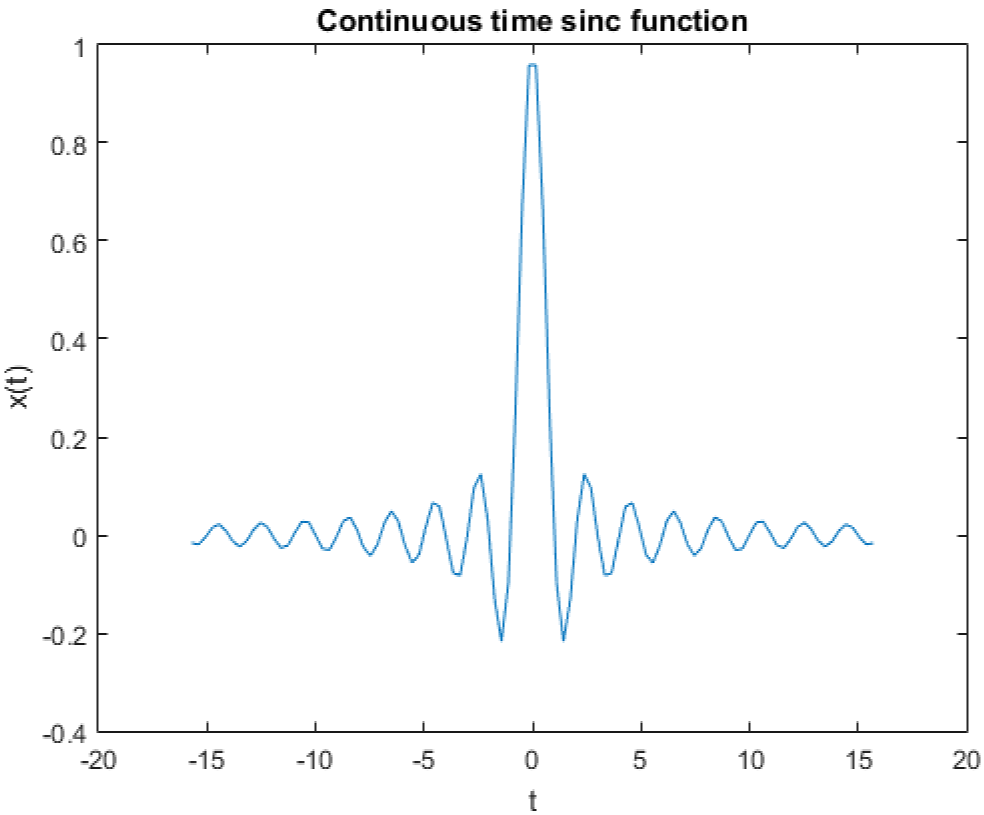
The sinc function sinc(x), also called the "sampling function," is a function that arises frequently in signal processing and the theory of Fourier transforms. The full name of the function is "sine cardinal," but it is commonly referred to by its abbreviation, "sinc" and is defined by

$$\operatorname{sinc}(x) \equiv \begin{cases} 1 & \text{for } x = 0 \\ \dfrac{\sin x}{x} & \text{otherwise,} \end{cases}$$

Code:

```
y2 = sinc(x);   %sinc function
 figure;
plot(x,y2);
title('Continuous time sinc function')
xlabel('t');
ylabel('x(t)');
```

Output:



6. Generate a continuous time exponential (growing, decaying, DC signal)

Theory:

A continuous time exponential signal is a mathematical signal of the following form:

$x(t)=e^{at}$

If a>0; it is growing signal
If a<0; it is decaying signal
If a=0; it is DC signal

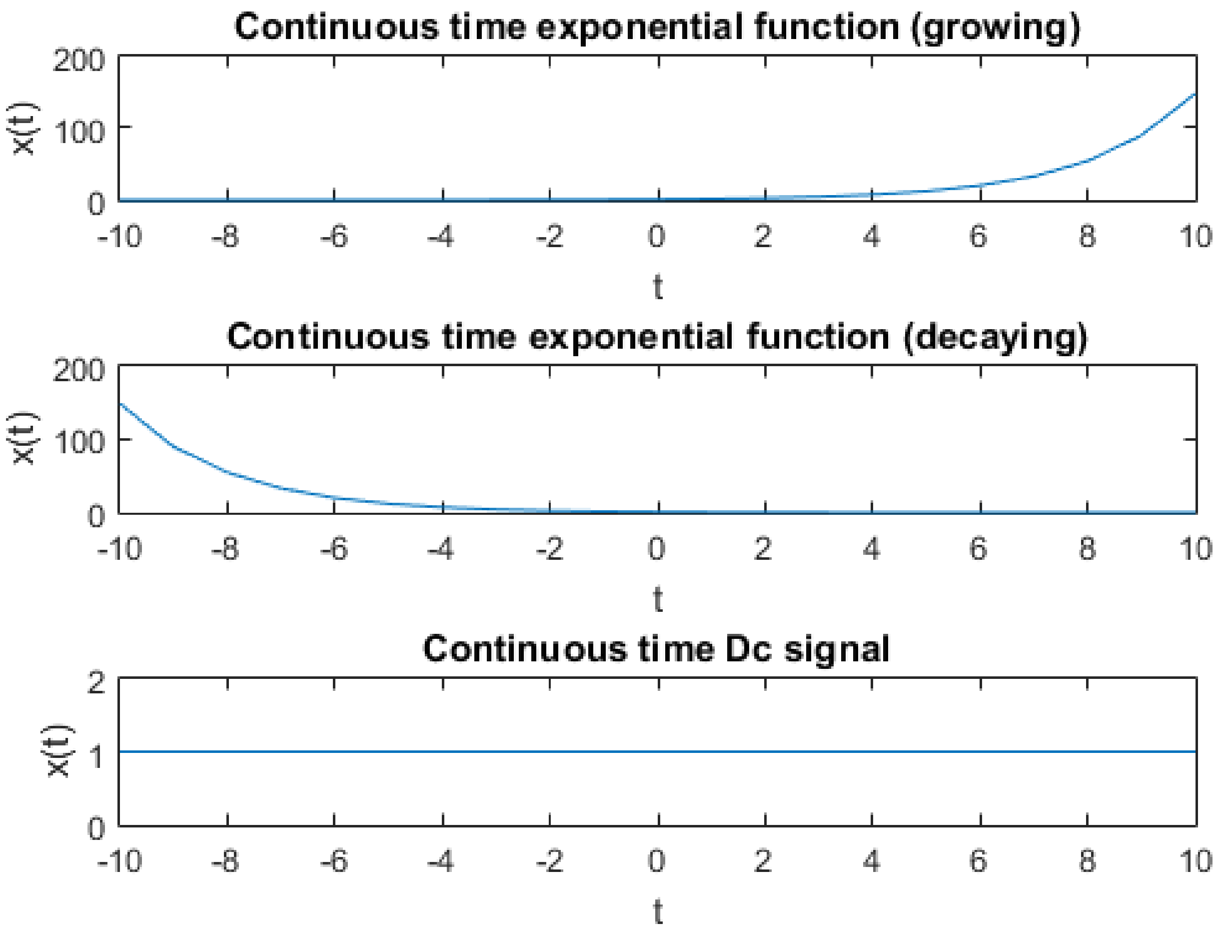
Code:

```
figure;
y=exp(0.5*t);   %growing continuous exponential function
subplot(3,1,1);
plot(t,y);
title('Continuous time exponential function (growing)')
xlabel('t');
ylabel('x(t)');

y=exp(-0.5*t);  %decaying continuous exponential function
subplot(3,1,2);
plot(t,y);
title('Continuous time exponential function (decaying)')
xlabel('t');
ylabel('x(t)');
```

```
y =exp(0*t);  %DC signal
subplot(3,1,3);
plot(t,y);
title('Continuous time Dc signal')
xlabel('t');
ylabel('x(t)');
```

Output:



Conclusion:

Thus, we studied about different types of signal and represented them in MATAB and viewed the graphs.