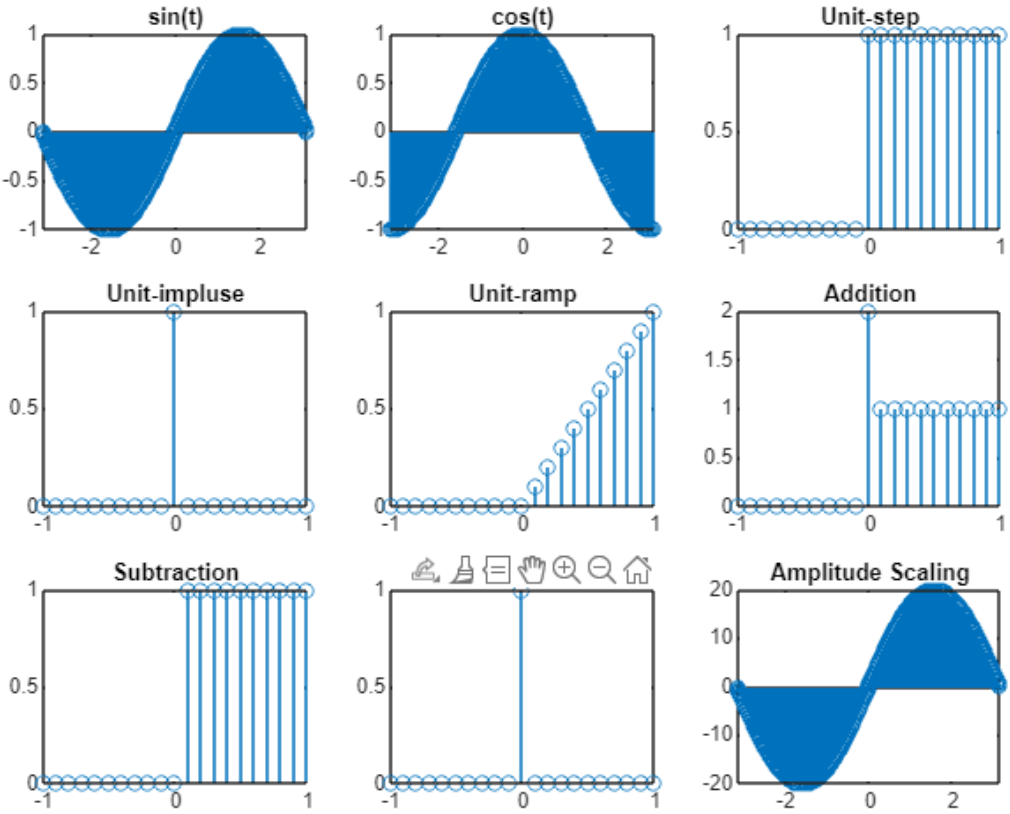
Digital Signal Processing
Experiment 01

Basic Functions:

```
t=-pi:0.01:pi;
y=sin(t);
subplot(3,3,1), stem(t,y);
title('sin(t)');

t=-pi:0.01:pi;
y=cos(t);
subplot(3,3,2), stem(t,y);
title('cos(t)');

t=-1:0.1:1;
unitstep=t>=0;
subplot(3,3,3), stem(t,unitstep);
title('Unit-step');

impluse=t==0;
subplot(3,3,4), stem(t,impluse);
title('Unit-impluse');

ramp=t.*unitstep;
subplot(3,3,5), stem(t,ramp);
title('Unit-ramp');

add=impluse+unitstep;
subplot(3,3,6), stem(t,add);
title('Addition');

sub=unitstep-impluse;
subplot(3,3,7), stem(t,sub);
title('Subtraction');

mul=impluse.*unitstep;
subplot(3,3,8), stem(t,mul);
title('Multiplication');

t2=-pi:0.01:pi;
y=20.*sin(t2);
subplot(3,3,9), stem(t2,y);
title('Amplitude Scaling');
```

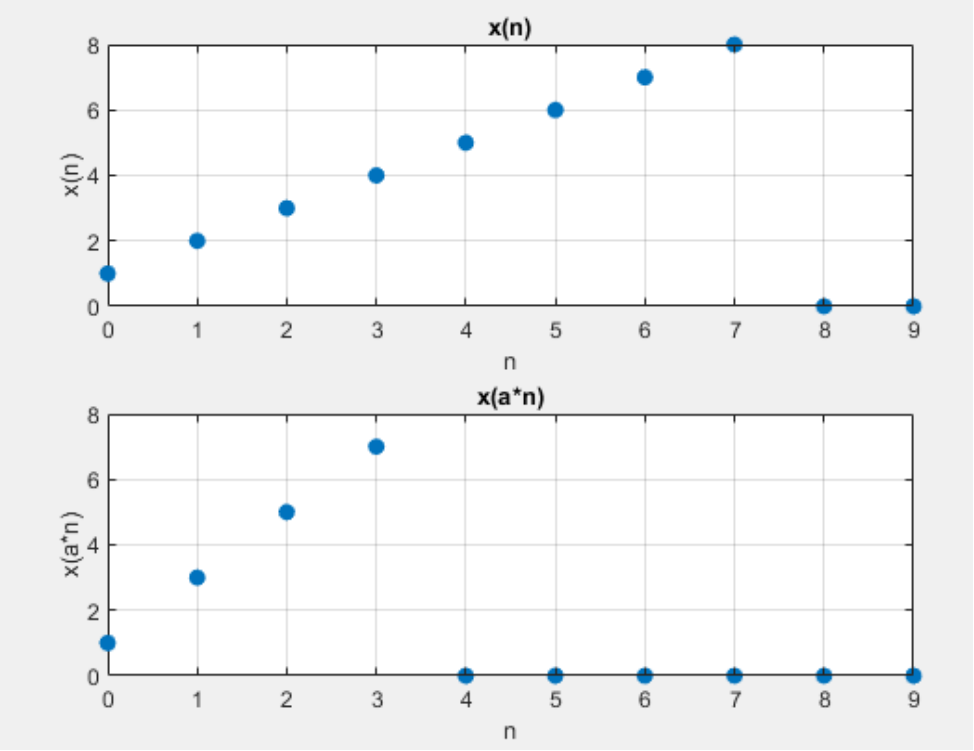


Compression:

```
a = input('Enter the scaling factor a: ');
x = [1, 2, 3, 4, 5, 6, 7, 8, 0, 0];
n = 0:9;
indices = a * n;

% Initialization with zero
x_an = zeros(1, length(n));

% Handling out-of-bound indices by assigning 0
for i = 1:length(indices)
    if indices(i) >= 0 && indices(i) + 1 < length(x)
        x_an(i) = x(indices(i) + 1);
    else
        x_an(i) = 0;
    end
end

% Ploting x(n) and x(an)
figure;

% x(n)
subplot(2, 1, 1);
stem(n, x, 'filled');
title('x(n)');
xlabel('n');
ylabel('x(n)');
grid on;
```

```
% x(an)
subplot(2, 1, 2);
stem(n, x_an, 'filled');
title(['x(a*n)']);
xlabel('n');
ylabel(['x(a*n)']);
grid on;

% Display the result
disp(['x(an) where a = ', num2str(a), ' is:']);
disp(x_an);
```

```
Enter the scaling factor a: 2
x(an) where a = 2 is:
     1     3     5     7     0     0     0     0     0     0
```



Expansion:

```
a = input('Enter the scaling factor a: ');
x = [1, 2, 3, 4, 5, 6, 7, 8, 0];
n = 0:8;
indices = a * n;

% Initialization zero
x_an = zeros(1, length(n));

% Handle out-of-bound indices by assigning 0
for i = 1:length(indices)
    if mod(indices(i), 1) == 0 &&  indices(i) >= 0 && indices(i) + 1 < length(x)
        x_an(i) = x(indices(i) + 1);
    else
```

```
        x_an(i) = 0;
    end
end

% Plot x(n) and x(an)
figure;

% Plot x(n)
subplot(2, 1, 1); % 2 rows, 1 column, 1st plot
stem(n, x, 'filled');
title('x(n)');
xlabel('n');
ylabel('x(n)');
grid on;

% Plot x(an)
subplot(2, 1, 2);
stem(n, x_an, 'filled');
title(['x(a*n) where a = ', num2str(a)]);
xlabel('n');
ylabel(['x(a*n) for a = ', num2str(a)]);
grid on;

% Display the result
disp(['x(an) where a = ', num2str(a), ' is:']);
disp(x_an);
```

```
Enter the scaling factor a: 0.5
x(an) where a = 0.5 is:
     1     0     2     0     3     0     4     0     5
```