Assignment 4
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ECE 309
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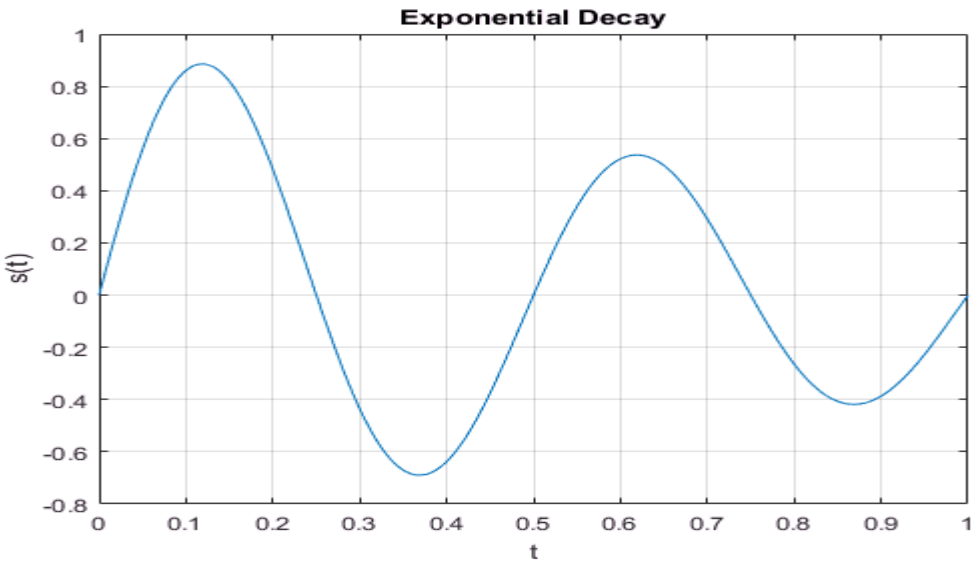
## ***Problem Set 7***

### Problem Set 7-1:

Generate a plot for the decaying exponential:
$s(t) = \sin(4\pi t)\exp(-t)$, for t values from 0 to 1 sec.

```
t = 0:0.001:1;
s = sin(4*pi*t) .* exp(-t);

plot(t,s), xlabel('t'),ylabel('s(t)')
grid, title('Exponential Decay')
```

**Results**

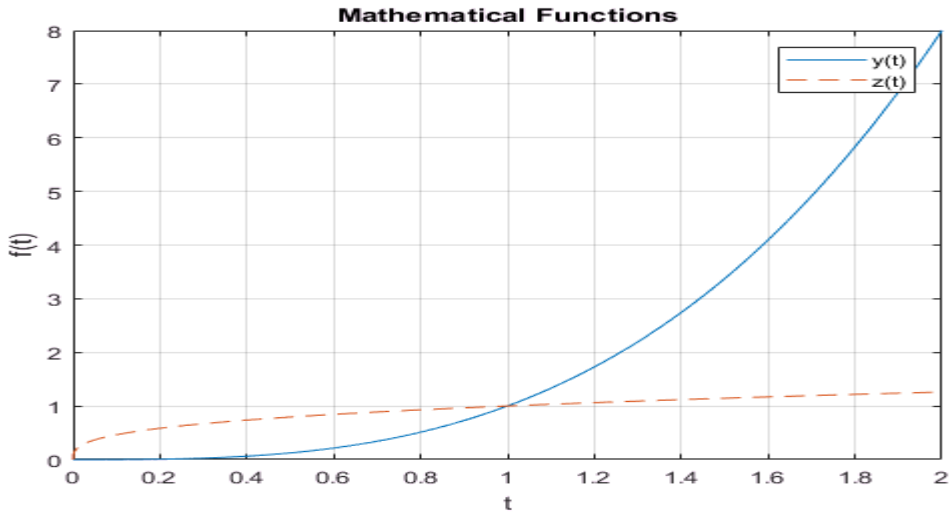



### Problem Set 7-2:

Plot y(t)= t^3 and z(t)= t^(1/3), for 0 ≤t ≤2, on a single graph. Make the plot for *z* a dashed line, and the plot for *y* a solid line.

```
t = 0:0.001:2;
y = t.^3;
z = t.^(1/3);
plot(t,y,t,z,'--')
xlabel('t'), ylabel('f(t)');
grid, title('Mathematical Functions');
legend('y(t)', 'z(t)')
```

**Results**



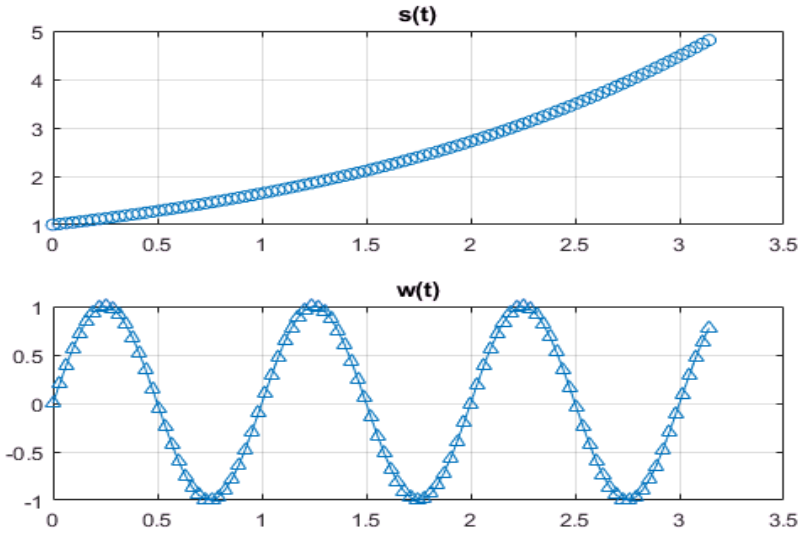

s(t)

## Problem Set 7-3:

Plot s(t) = e^(t/2), and w(t) = sin(2pt), for 0 ≤ t ≤ p, one underneath the other on a single page. Use circles for the data points for s, with no line connecting the points. Use triangles for the data points for w, with a solid line connecting the points.

```
t = linspace(0, pi, 100);
s = exp(t/2);
w = sin(2*pi*t);
subplot(2,1,1), plot(t,s,'o')
grid, title('s(t)');
subplot(2,1,2), plot(t,w,'-^')
grid, title('w(t)'); figure
```

**Results**

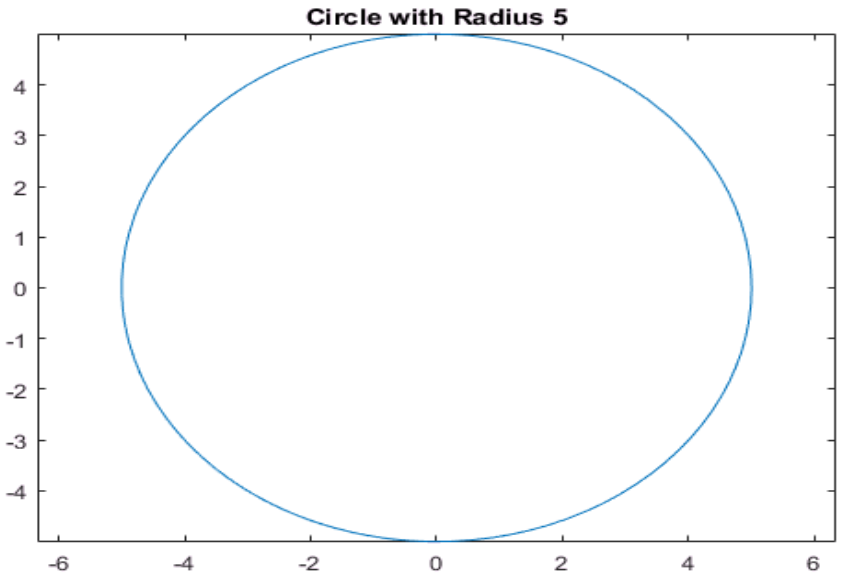


## Problem Set 7-4:

Recall that the x and y coordinates for a point on a circle of radius r, at angle q, are: x = r cos(q),y = r sin(q). To plot a circle of radius 5:

```
% a. Create a vector containing 100  q-values, linearly spaced
% between 0 and 2pi.
v = linspace(0, 2*pi,100);

% b. Create a vector of corresponding x values (one for each value of q)
% and another vector of corresponding y values (one for each value of q),
% assuming that the radius of the circle is 5.
x = 5 * cos(v);
y = 5 * sin(v);

% d. Generate a plot of (x, y) values. After your plot command, insert the
% command:   axis('equal')   to make the scaling on the x and y axes
identical (to avoid distortion of the circle).
plot(x,y)
title('Circle with Radius 5')
axis('equal')
figure
```

**Results**

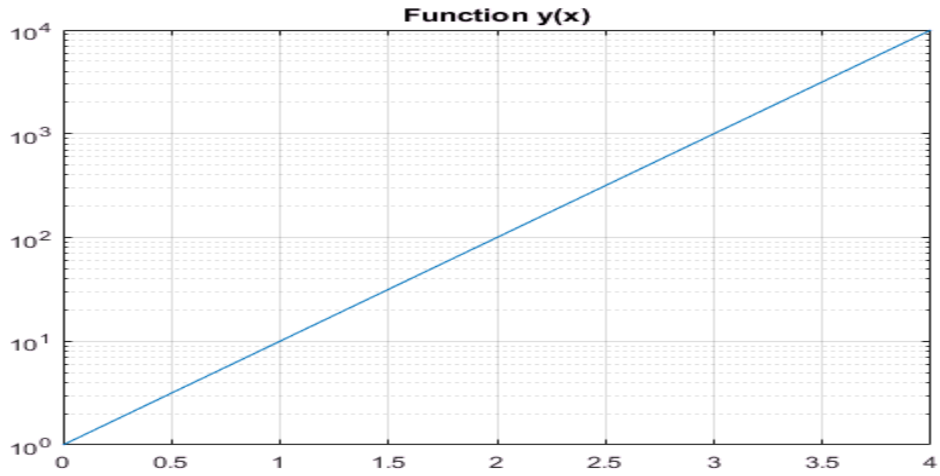



## Problem Set 7-5:

Plot the function y = 10x, for x values ranging from 0 to 4, using a linear scale on the x-axis and a log scale on the y-axis.

```
x = linspace(0,4,100);
y = 10.^x;
semilogy(x,y), grid
title('Function y(x)')
```

**Results**

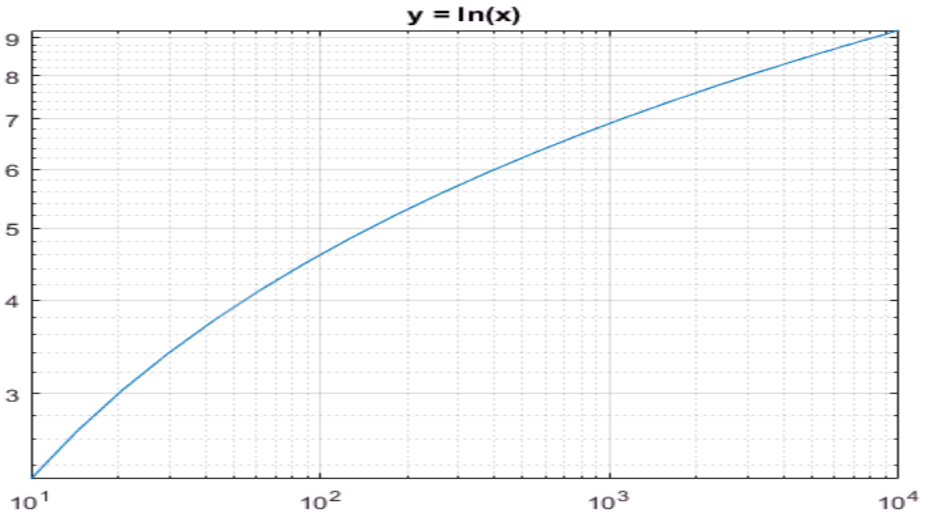



## Problem Set 7-6:

Generate a vector x containing 20 points, logarithmically spaced, between 1 and 10,000. Plot y = ln(x), using a log scale on both the x and y axes.

```
x = logspace(1,4,20);         % 1 - 10^4; 20 spaces
y = log(x);
loglog(x,y), grid
title('y = ln(x)')
```

**Results**

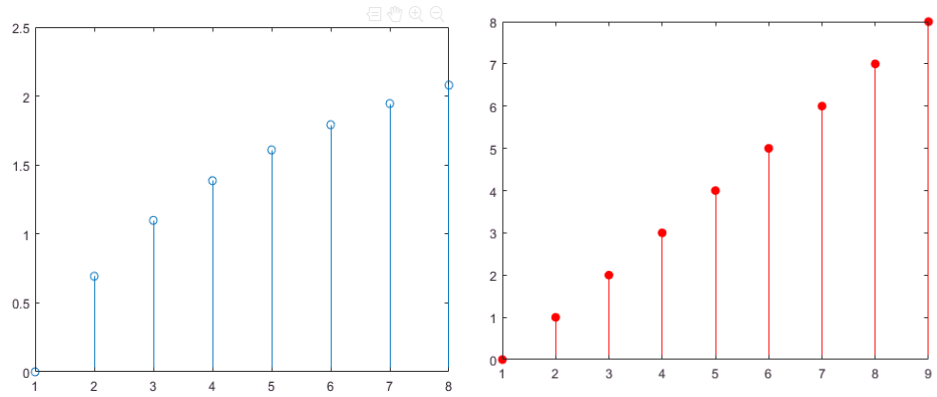



## Problem Set 7-7:

```
% 7a. For integer values of n ranging from 0 to 8, plot the discrete data set:
% x[n] = ln(n)
n = [0:8];
x = log(n);
stem(n,x)
```

```
% 7b. Generate another plot for the data given in 7a, with the data circles filled in.
m = [0:8];
y = log(m);
stem(m,'ro', 'filled')
```

**Results**

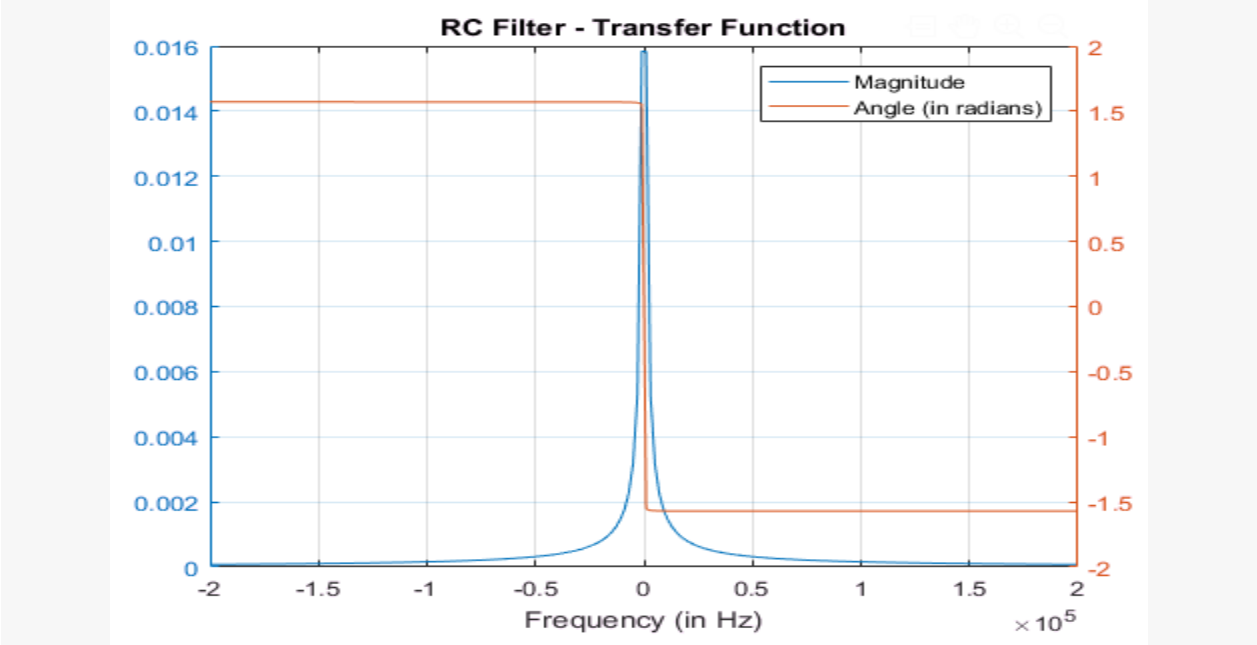



## Problem Set 7-8:

Recall that the RC filter has transfer function: H(f) = (1 + 2*pi*f*R*C)^-1. For frequencies ranging from f = -200 KHz to 200 KHz, with R = 10 KΩ and C = 1 µF, plot the magnitude and phase angle for the transfer function, on one plot, with the left vertical axis showing |H(f)|, and the right vertical axis showing the phase angle, in radians.

```
% Program Name: graphs.m
% Author: Juan Silva Last Modified: Feb. 20, 2018
% Description: This program will graph the transfer function using plotyy in
order to graph two separate plots into one graph.

clear, clc, close all
format short, format compact

% *** Define variables ***
R = 10e3;      %kΩ
C = 1e-6;      %µF

% *** Start Code ***
f = linspace(-200e3, 200e3, 200);
h = (1 + j*2*pi*f*R*C).^-1;
magH = abs(h);                          %Produce magnitude
angH = angle(h);                        %Produce angle in radians

% Magnitude is left side
plotyy(f,magH,f,angH)
grid
title('RC Filter - Transfer Function');
legend('Magnitude', 'Angle (in radians)')
xlabel('Frequency (in Hz)')
```

**Results**


RC Filter - Transfer Function
Magnitude
Angle (in radians)
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
Frequency (in Hz)
×10^5