WENTWORTH
Institute of Technology

Lab 1 – Introduction to MATLAB

Dan Meyer, Michael Browne

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Wentworth Institute of Technology

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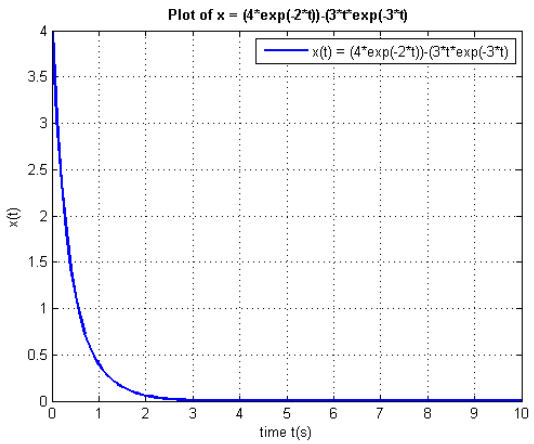
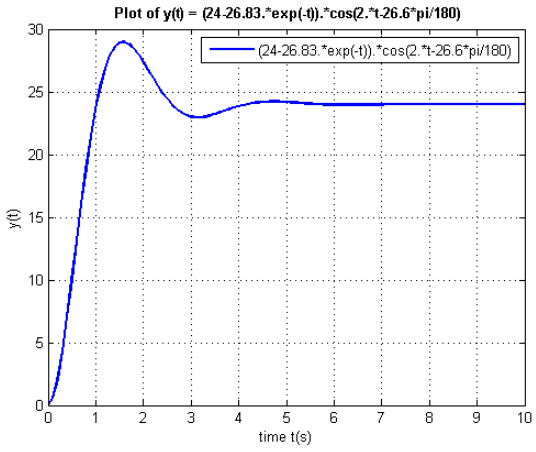
Introduction

Signals and Systems is the study and application of data processing, taking various inputs and processing them through the use of time-domain and Fourier Transforms into the desired output ranges. This lab serves as an introduction to Matlab; a program used for signal processing. The goal of this lab was to introduce students to Matlab scripting, as well as graphing the outs from these scripts.

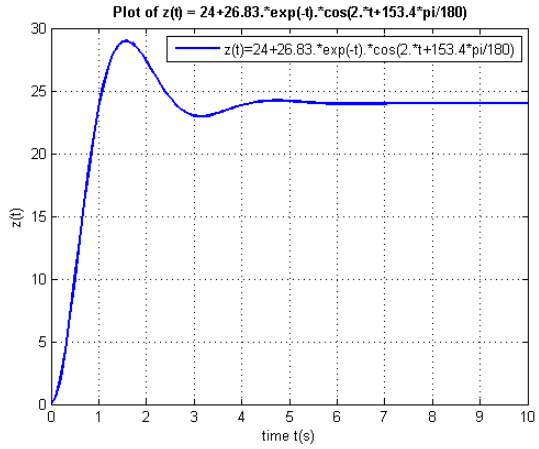
Part One

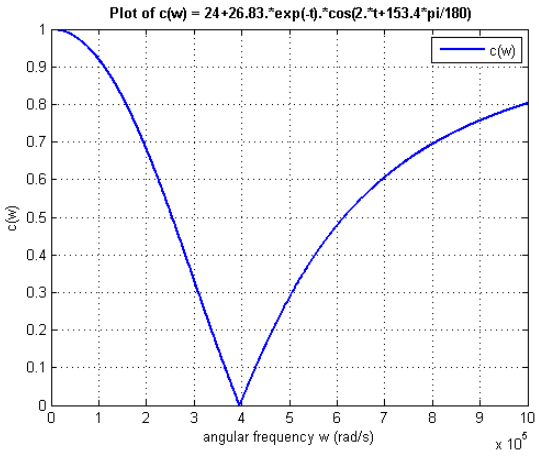
Signal	MATLAB Code

	`t = 0:0.1:10;`
	`x = (4.*exp(-2.*t))-(3.*t.*exp(-3.*t));`
	`plot(t,x,'linewidth',2);`
	`legend('x(t) = (4*exp(-2*t))-(3*t*exp(-3*t)');`
	`title('\bf Plot of x = (4*exp(-2*t))-(3*t*exp(-3*t)');`
	`xlabel('time t(s)');`
	`ylabel('x(t)');`
	`grid on;`

	`t = 0:0.1:10;`
	`y =24-26.83.*exp(-t).*cos(2.*t-26.6*pi/180);`
	`plot(t,y,'linewidth',2);`
	`legend('(24-26.83.*exp(-t)).*cos(2.*t-26.6*pi/180)');`
	`title('\bf Plot of y(t) = (24-26.83.*exp(-t)).*cos(2.*t-26.6*pi/180)');`
	`xlabel('time t(s)');`
	`ylabel('y(t)');`
	`grid on;`

Signal	MATLAB Code

	`t = 0:0.1:10;`
	`z =24+26.83.*exp(-t).*cos(2.*t+153.4*pi/180);`
	`plot(t,z,'linewidth',2);`
	`legend('z(t)=24+26.83.*exp(-t).*cos(2.*t+153.4*pi/180)');`
	`title('\bf Plot of z(t) = 24+26.83.*exp(-t).*cos(2.*t+153.4*pi/180)');`
	`xlabel('time t(s)');`
	`ylabel('z(t)');`
	`grid on;`

	`w = 0:10:1000000;`
	`R = 1000;`
	`L = 0.004;`
	`C = 0.0016*10^-6;`
	
	`c =(abs((1./(L.*C))-w.^2))./(sqrt(((1./(L.*C))-w.^2).^2+(w./(R.*C)).^2));`
	`plot(w,c,'linewidth',2);`
	`legend('c(w)');`
	`title('\bf Plot of c(w) = 24+26.83.*exp(-t).*cos(2.*t+153.4*pi/180)');`
	`xlabel('angular frequency w (rad/s)');`
	`ylabel('c(w)');`
	`grid on;`

The plots for y(t) and z(t) are identical because they are the same signal, with a 180° phase shift applied.

Part Two

Data

Simulation

Time(s)	Values
0	0.04
0.5	0.85
1	1.15
1.5	0.95
2	1
2.5	0.97
3	0.98

Table 1: Simulated result data for an unknown process

Experimental

Time(s)	Values
0	0.03
0.5	0.86
1	1.15
1.5	1
2	1.01
2.5	0.98
3	0.99

Table 2: "Experimental" result data for an unknown process

MATLAB Code

```
clear all; close all;

% analytical

t = 0:0.1:3;
c = 1-1.1577*exp(-2.0363*t).*cos(3.49*t-30.25*pi/180);
plot(t,c, 'r');
hold on;

% simulation

sim_data =
[0,0.03;0.5,0.86;1,1.15;1.5,1;2,1.01;2.5,0.98;3,0.99];

plot(sim_data(:,1),sim_data(:,2), 'b');

% experimental

exp_data = [0,0.04;.5,.85;1,1.15;1.5,.95;2,1;2.5,0.97;3,.98];
plot(exp_data(:,1),exp_data(:,2),'bl*');
legend('Analytical','Simulation Data','Experimental Data');
xlabel('time (second)');
```

Output

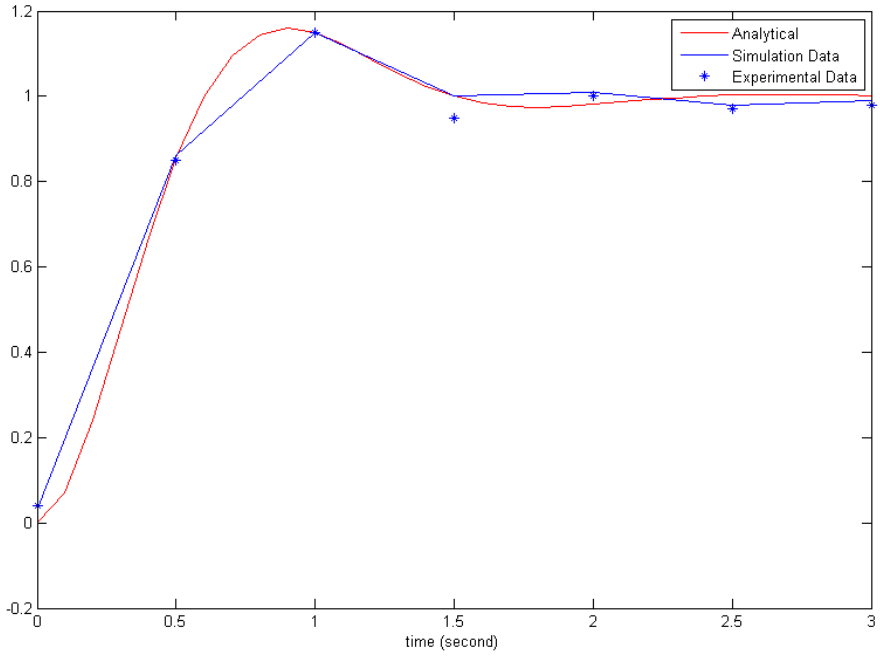


Figure 1: A comparison graph of result data gathered