

University of Kentucky
Department of Electrical and Computer Engineering

EE421G: Signals and Systems I – Fall 2007

Problem Set 5

Issued: September 24, 2007

Due: October 1, 2007 (In class)

Reading Assignments:

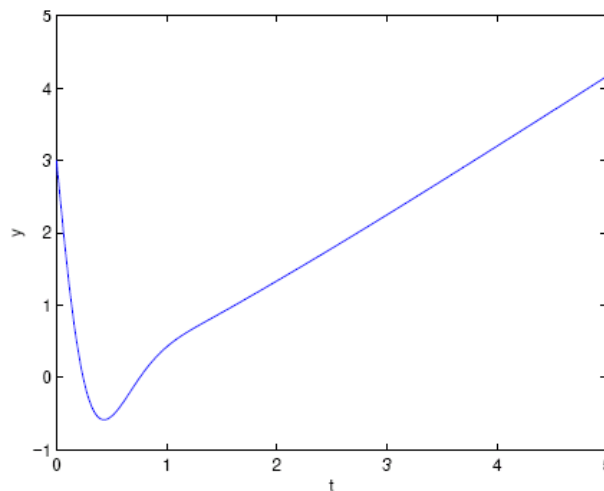
Read Chapter 3.7, 3.8 of Chen and Matlab Notes

Computer Assignments:

1) Use Matlab to plot y versus t with t=0:0.01:5 and y defined as

$$y = 3e^{-4t} \cos(5t) - 2e^{-3t} \sin(2t) + \frac{t^2}{t+1}$$

```
t=0:0.01:5;  
y=3*exp(-4*t).*cos(5.*t)-2*exp(-3*t).*sin(2*t)+t.^2./(t+1);  
plot(t,y)  
xlabel('t')  
ylabel('y')
```



2) Given two polynomials:

$$f(x) = x^5 - 3x^4 + 5x^2 + 7x + 9$$

and

$$g(x) = 2x^6 - 8x^4 + 4x^2 + 10x + 12$$

Find all the solutions to the equation

$$f(x)g(x) = 0$$

```
f = [1 -3 0 5 7 9];  
g = [2 0 -8 0 4 10 12];  
fg = conv(f,g)  
roots(fg)
```

```
ans =  
2.4186 + 1.0712i  
2.4186 - 1.0712i  
1.6760 + 0.4922i  
1.6760 - 0.4922i  
-1.9304  
-0.2108 + 0.9870i  
-0.2108 - 0.9870i  
-0.3370 + 0.9961i  
-0.3370 - 0.9961i  
-1.1633  
-1.0000
```

- 3) We have seen the aliasing effect visually during lecture. In this problem, you are asked to explore the aliasing effect in audio. Download the MATLAB script `aliasing_demo_audible.m` from the homework webpage and run it. You will hear six tones at different frequencies: 500Hz, 2kHz, 3kHz, 4.5kHz, 5.5kHz and 7kHz. All the signals are sampled at 5kHz. Explain what you hear based on the perceived pitch.

Aliasing occurs in the last four tones resulting in distortion on the pitch.