

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

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

- 2) Given two polynomials:

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

and

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

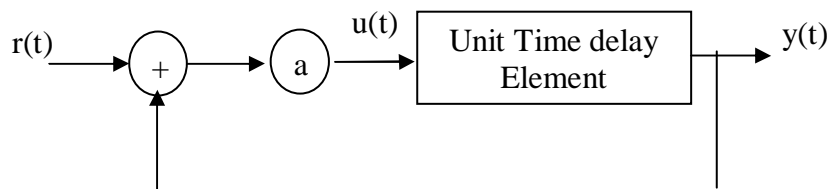
Find all the solutions to the equation

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

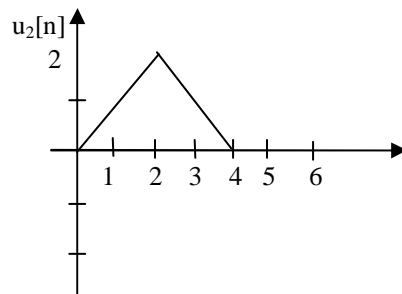
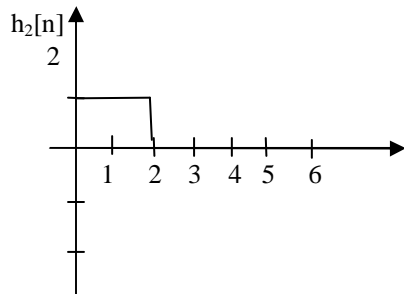
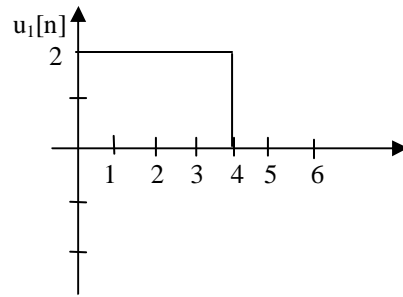
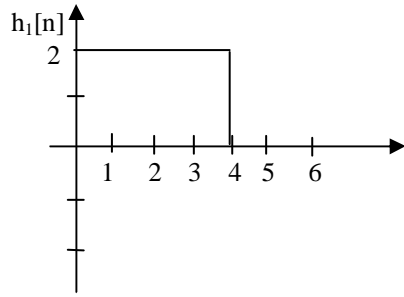
- 3) We have seen the aliasing effect visually during lecture. In this problem, you are asked to explore the aliasing effect in audio. Download the MATLAB script `aliasing_demo_audible.m` from the homework webpage and run it. You will hear six tones at different frequencies: 500Hz, 2kHz, 3kHz, 4.5kHz,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

**Paper and Pencil Assignments:**

- 1) Problem 3.14: Consider the positive feedback system shown below. Find its impulse response.



2) Problem 3.15: Compute the integral convolution of  $h_i(t)$  and  $u_i(t)$ , shown below.



3) Problem 3.18: Find a differential equation to describe the following network.

