

GEORGIA INSTITUTE OF TECHNOLOGY  
School of Electrical and Computer Engineering

**ECE 4270**  
Fundamentals of Digital Signal Processing

Assigned: Thursday, Aug. 27, 2009  
Due: Thursday, Sept. 3, 2009

## Problem Set #2

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**Reading:** Read the following sections from Oppenheim and Schaffer:  
Chapter 2, Sections 2.5–2.6, pp. 34–48.

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**Problem 2.1:** Work Oppenheim and Schaffer Problem 2.11 on page 72.

**Problem 2.2:** Work Oppenheim and Schaffer Problem 2.32 on page 76.

**Problem 2.3:** Work Oppenheim and Schaffer Problem 2.42 on page 80. Try to work this problem using only the material up to and including Section 2.6, i.e. you should not need to exploit any properties of the Fourier transform.

**Problem 2.4:** Work Oppenheim and Schaffer Problem 2.57 on page 84.

**Problem 2.5:** This problem does some further exploration of the simple first-order difference equation

$$y[n] - ay[n - 1] = x[n]$$

with the input sequence  $x[n] = \delta[n]$ .

- If the auxiliary condition is  $y[-1] = 0$  determine  $y[n]$  for all  $n$ , i.e., include all negative and all positive values of  $n$ .
- Repeat part (a) but this time use the different auxiliary condition  $y[1] = 0$ .
- You should have observed that the solutions for parts (a) and (b) are different. If the auxiliary condition is changed to  $y[n_0] = 0$ , for which values of  $n_0$  will the solution be the same as in part (a), for which values of  $n_0$  will the solution be the same as in part (b), and for which values of  $n_0$  will the solution be different from both of these?
- For which values of  $a$  is the causal system stable?
- For which values of  $a$  is the anti-causal system stable?