MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Electrical Engineering and Computer Science

6.003: Signals and Systems—Fall 2003

PROBLEM SET 3

Issued: September 18, 2003 Due: September 26, 2003

Reading Assignments:

Lectures #5-6 & PS#2: Chapter 3 of Oppenheim and Willsky (O&W)

Lectures #3-4 & PS#3: Chapters 3&4 of Oppenheim and Willsky (O&W)

Exercise for home study (not to be turned in, although we will provide solutions):

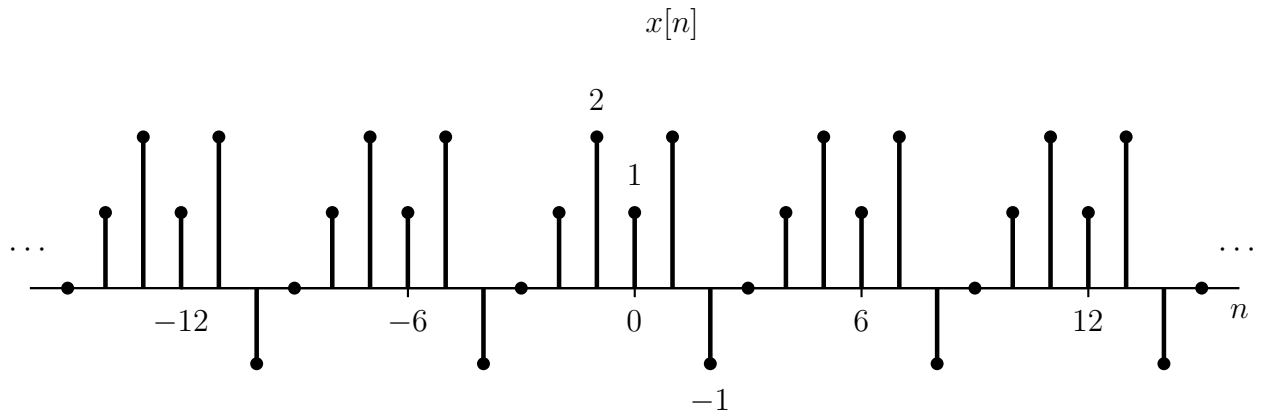
O&W 3.46 (a),(c)

Problems to be turned in:

Problem 1 O&W 3.22 (a) - only the signal in Figure p3.22 (c)

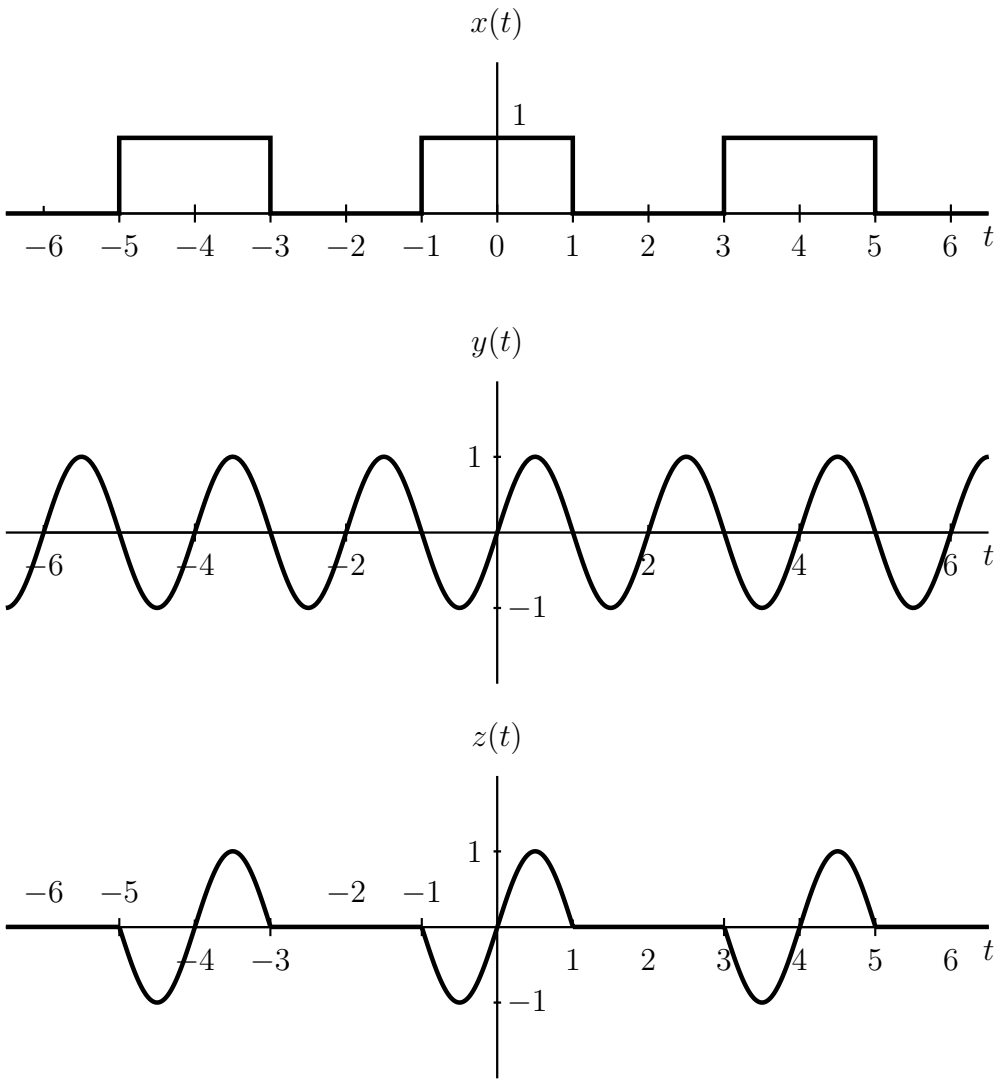
Problem 2 O&W 3.23 (a)

Problem 3 Determine the Fourier series coefficients for the periodic signal $x[n]$ depicted below. Plot the magnitude and phase of these coefficients.



Problem 4 O&W 3.29 (a)

Problem 5 Consider the following CT periodic signals, $x(t)$, $y(t)$, and $z(t)$.



(a) Determine the fundamental frequency, period, and Fourier series coefficients, a_k, for $x(t)$.

(b) Determine the fundamental frequency,period, and Fourier series coefficients, b_k, for $y(t)$.

(c) Determine the fundamental frequency and period for $z(t)$. Also, using the results of parts (a) and (b), determine the Fourier series coefficients, c_k for $z(t)$.

Problem 6 Let $x(t)$ be a periodic signal with fundamental period T and Fourier series coefficients a_k. Derive the Fourier series coefficients of each of the following signals in terms of a_k:

(a) $\mathcal{O}d\{x(t - T/2)\}$

(b) $x(T/4 - t)$

Problem 7 O&W 3.31 (also determine a_0)

Problem 8 O&W 3.51

Reminder: The first 20 problems in each chapter of O&W have answers included at the end of the text. Consider using these for additional practice, either now or as you study for tests.