

ECE 130A: Problem Set 2

Assigned: Monday, October 8

Due: Tuesday, October 16

Reading: 1.5, 1.6, 2.2, 2.3

Problem 1 *Types of systems:* 1.27 (a), (b), (d), (f)

Problem 2 *Convolution:* 2.22 (a), (c), (e)

Problem 3 *Convolution* Let $x_1(t) = u(t + 3) - u(t - 3)$ and $x_2(t) = u(t + 1) - u(t - 1)$.

(a) Sketch x_1 and x_2 .

(b) Find and sketch the convolution $y(t) = (x_1 * x_2)(t)$.

(c) Sketch $x_3(t) = 3x_1(t - 2)$ and $x_4(t) = 4x_2(t + 3)$.

(d) Find and sketch $z(t) = (x_3 * x_4)(t)$.

Hint: Try to do as little additional work as possible for part (d).

Problem 4 *Causality and stability* 2.29 (a), (b), (d), (e)

Problem 5: *LTI system response* 2.40

Problem 6: Use matlab to plot the functions $x_1(t) = I_{[0,2]}(t)$, $x_2(t) = I_{[0,4]}(t)$, and $y(t) = (x_1 * x_2)(t)$. Compare what you get with the answer you get by computing and sketching the convolution by hand.

Hint: Create vectors by sampling these functions fast (e.g., spaced by 0.1) and convolve the functions using matlab's convolution function. You will then have to scale the convolution in some way to get the answer obtained by the hand computation of the continuous-time convolution. Note also that the index of a matlab vector starts from one, whereas our time variable starts from zero.