EECS 120 Signals & Systems — University of California, Berkeley: Spring 2005
Ramchandran — January 21, 2005

Recitation 1
Week of Jan 24-28

Topics System properties, signal manipulations, convolution

Problem 1

For the following systems, x is the input and y is the output. Determine if each is linear, time-invariant, memoryless, stable and causal.

(a) $y(t) = \frac{d}{dt}e^{-t}x(t)$

(b) $y[n] = x[2^n + 1]$

Problem 2

We define $x(t)$ below. Graph the following signals.

$$x(t) = \begin{cases} 0, & |t| > 1 \\ 1, & -1 \le t \le 0 \\ 1 - t, & 0 \le t \le 1 \end{cases}$$

(a) $x(3t)$

(b) $x(t+2)$

(c) $x(-3t+2)$

(d) $x(\frac{1}{3}t + 2)$

Problem 3

Graphically convolve the following pairs of signals.

(a) $x(t) = \begin{cases} 0, & |t| > 1 \\ 1 - |t|, & |t| \le 1 \end{cases}$

$y(t) = \delta(t-2) + \delta(t+2)$

(b) $x(t) = \begin{cases} 0, & |t| > 1 \\ 1 - |t|, & |t| \le 1 \end{cases}$

$y(t) = u(t)$

(c) $x(t) = u(t) - u(t-1)$

$y(t) = x(t-1) + x(t+2)$

Problem 4 Analytically convolve the following pairs of signals.

(a) $x(t) = e^{-t}u(t)$
$y(t) = u(t)$

(b) $x(t) = e^{-t}u(t)$
$y(t) = e^{-2t}u(t)$