American University of Beirut
Department of Electrical and Computer Engineering

EECE 440 Signals and Systems

Homework 1: Due February 26, 2007 at 12:00

Problem 1

Determine if each of the following signals is an energy signal or a power signal by deriving the energy or the time averaged power of the signal:

a) x(t) = A[u(t+2a) – u(t-4a)] a > 0;

b) x(t) = sin(wt)

Problem 2

Determine if the following systems are:

1. Memoryless
2. Time-invariant
3. Linear
4. Causal
5. Stable

Justify your answers.

a. $y(t) = \frac{x(t)}{1 - x(t-1) - x(t-2)}$ b. $y(t) = e^{-kt}x(t)$ with k>0.

Problem 3

Check whether or not the following signals are periodic. Determine the fundamental periods *T* for the periodic ones.

a) $x(t) = 3\cos(2\pi t)\sin(8\pi t)$

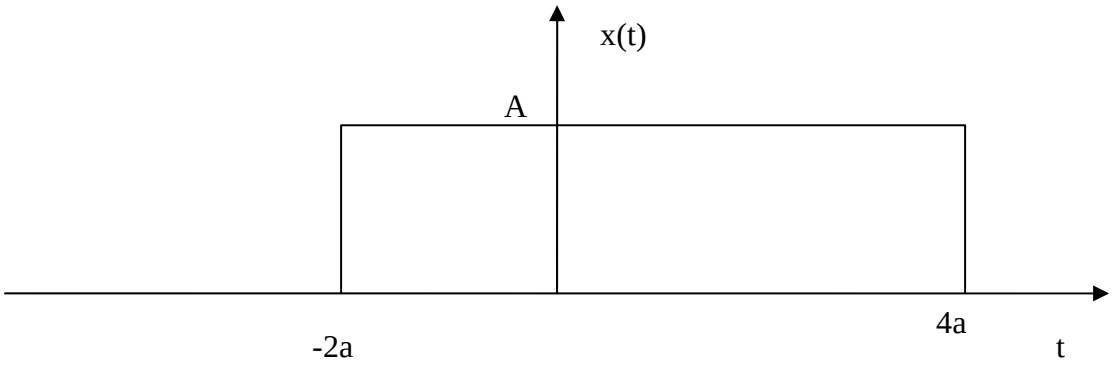
b) $x(t) = \cos(5\pi t) + \sin(3\pi t)$

c) $x(t) = e^{-t}$

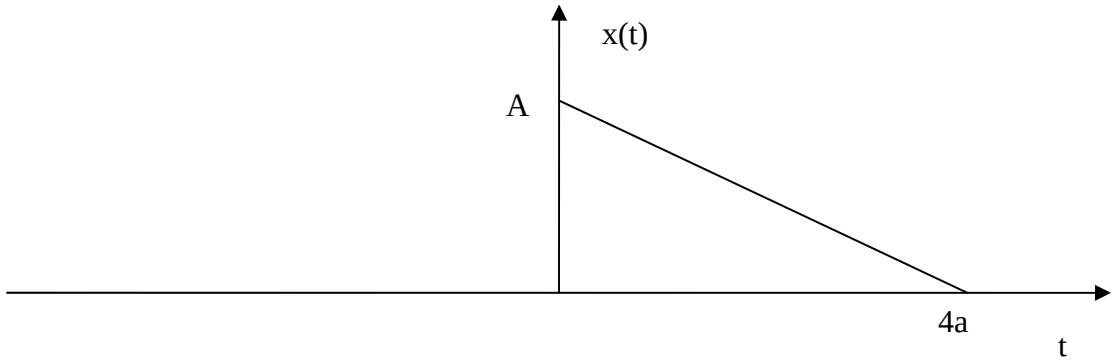
Problem 4

Compute and Graph the derivatives of the following functions:

a)



b)



Problem 5

Evaluate the following integrals:

a) $\int_{-\infty}^{+\infty} e^{\cos(\pi t)}\delta(t)dt$

b) $\int_{5}^{+\infty} e^{\cos(\pi t)}\delta(t-2)dt$

Matlab

Problem 1

Sketch the following functions using Matlab:

a) $x_1(t) = 4\sin(3\pi t)\left[u(t) - u(t-6)\right]$

b) $x_2(t) = -(t+5)u(t+5) - 2(t-2)u(t-2) + 4(t-5)u(t-5)$

Problem 2

Sketch on the same figure, the following functions using Matlab:

a) $x_1(t) = 4\sin(3\pi t)$

b) $x_2(t) = 2\cos(5\pi t)$

c) $y(t) = x_1(t) + x_2(t)$

Determine the period of y(t).