Student Name: ID#

Signals and Systems Midterm #1 – Dec. 2011

1. For each signal, determine if it is periodic, and if it is, find the fundamental period [5 Points Each]:

(a) $x(n)= (-1)^{3n}$

(b) $x(t)= 2\cos(2t) -3\sin(3t)$

(c) $x(t)= e^{(j2.4t)}$

(d) $x(t)= u(t)$

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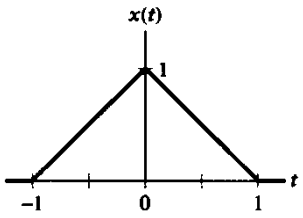
2. Categorize each of the following signals as a finite energy signal or a finite power signal, and find the energy or time-averaged power of the signal [5 Points Each]:

(a) $x(t)= 10^6\,[u(t-1) - u(t-10^9)]$

(b) $x(t)= u(t)\cos(t)$

(c) x(t) shown in the figure to the right



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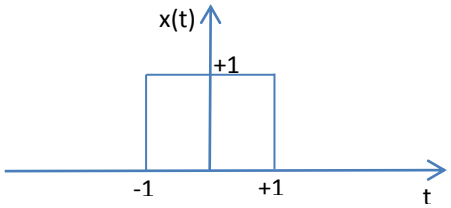
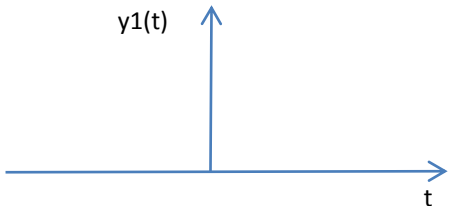
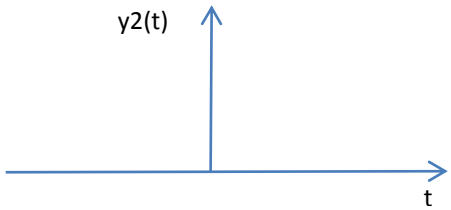
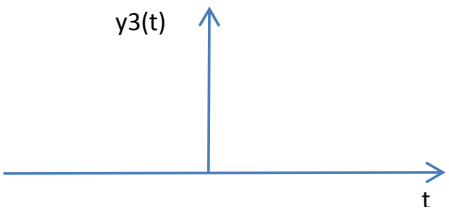
3. For the triangular pulse signal x(t) shown below, sketch each of the following signals derived from x(t) [5 Points Each]:

(a) y1(t)= x(3t)
(b) y2(t)= x(-2t-1)
(c) y3(t)= 5 x(t) – 3 x(t-1)









4. For each system, determine whether it is (i) memoryless, (ii) BIBO stable, (iii) causal, (iv) linear, and (v) time invariant [10 Points Each]:

(a) $y(t) = \int_{-\infty}^{\infty}[(u(\tau) - u(\tau - 1)] \cdot x(t - \tau)d\tau$

(b) $y(t) = \frac{dx}{dt} + 2$

(c) $y(t) = x(2t)$

(d) $y(n) = 2\, x(n + 3)$ u(n)

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5. Decompose the following signals into even and odd parts [5 Points Each]:

(a) x(t)= cos(2t) + sin($3t^2$)

(b) x(t)= [u(t) – u(t-1)]

(c) x(t)= t cos(t)

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6. For a linear time invariant (LTI) system, if the output of the system $y_1(t)$ is known for a particular input $x_1(t)$ as shown below, compute the output of the same system for an input $x_2(t)$ shown. [10 Points]