Student Name: ID#

Signals and Systems Midterm Makeup Exam

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

(a) $x(t)= 2\cos(2.1\pi)$

(b) $x(t)= e^{(j2.4t)} + 2\, e^{(j3.6t)}$

(c) $x(t)= \cos(5\, t^2)$

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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) $x(t)= e^{(-j\,2t)}$

(b) $x(t)= (u(t+1) - u(t-1)\,)\cos(t)$

(c) $x(t) = 2\cos(\,1.2\,t - \pi/6)$

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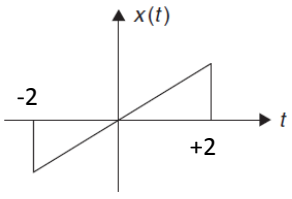
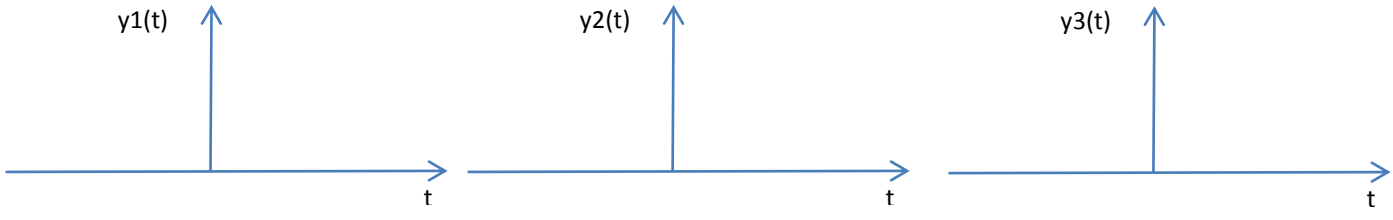
3. For the triangular pulse signal x(t) shown below, sketch each of the following signals derived from x(t) [5 Points Each]:



(a) y1(t)= x(2t+1)
(b) y2(t)= x(t)+ x(-t)
(c) y3(t)= x(t-4) + x(t+1)



4. For each system, determine whether it is (i) linear, and (ii) time invariant [10 Points Each]:

(a) $y(t) = \int_{-\infty}^{\infty} r(\tau) \cdot x(t-\tau) d\tau$ (recall that r(t) is the ramp signal)

(b) $y(t) = \frac{d^2x}{dt^2} + 2x$

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

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

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

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

(b) x(t)= u(t)

(c) x(t)= t sin(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(t) shown. [10 Points]