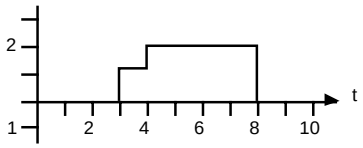
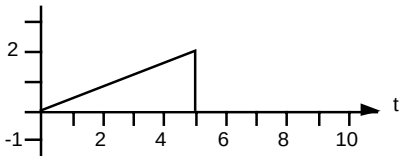
Homework Set 1 **EECS 206** **Assigned: Wed., Sept. 12, 2001**
Due: Wed., Sept. 19, in class, BEFORE lecture begins.

Reading relevant to this homework: Chapter 1. Chapter 2: pp. 9-23.
Please read the homework submission policies at the end of the assignment.

1. (a) Find the signal duration and signal energy (total over its duration) for each of the following signals.

(i) $x_1(t)$ = 

(ii) $x_2(t)$ = 

(iii) $x_3(t) = 3\sin(2t)$, $-\infty < t < \infty$

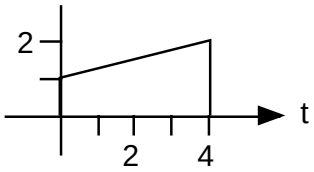
(iv) $x_4(t) = (-5)^{\text{floor}(t/3)}$, $-\infty < t < \infty$
(floor(z) = largest integer ≤ z)

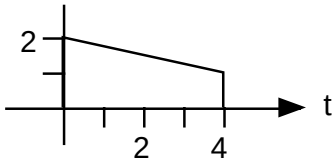
(b) Which of these signals are periodic? For those that are periodic, find their fundamental period.

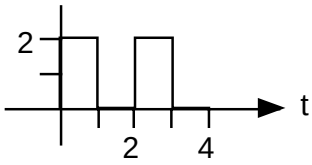
(c) For those signals whose energy is infinite, find the power.

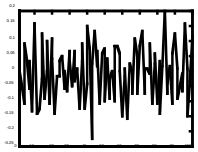
2. Let x(t) and y(t) be two signals whose durations are D_1 and D_2 seconds respectively. Is the duration of their sum $z(t) = x(t) + y(t)$ necessarily equal to the sum of their durations? Justify your answer.

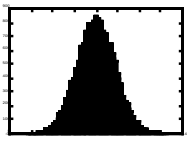
3. Match each signal below with its signal value distribution.

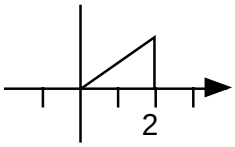
Signals: (a) 

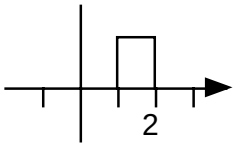
(b) 

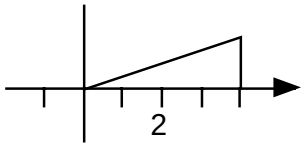
(c) 

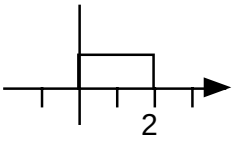
(d) 

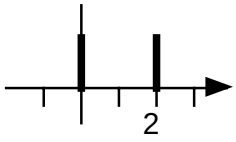
Signal value distributions: (i) 

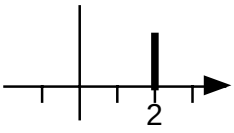
(ii) 

(iii) 

(iv) 

(v) 

(vi) 

(vii) 

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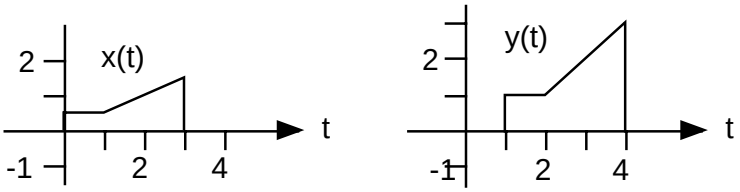
4. Show that if x(t) and y(t) are periodic with period T, and a and b are arbitrary numbers, then z(t) = a x(t) + b y(t) is also periodic with period T.

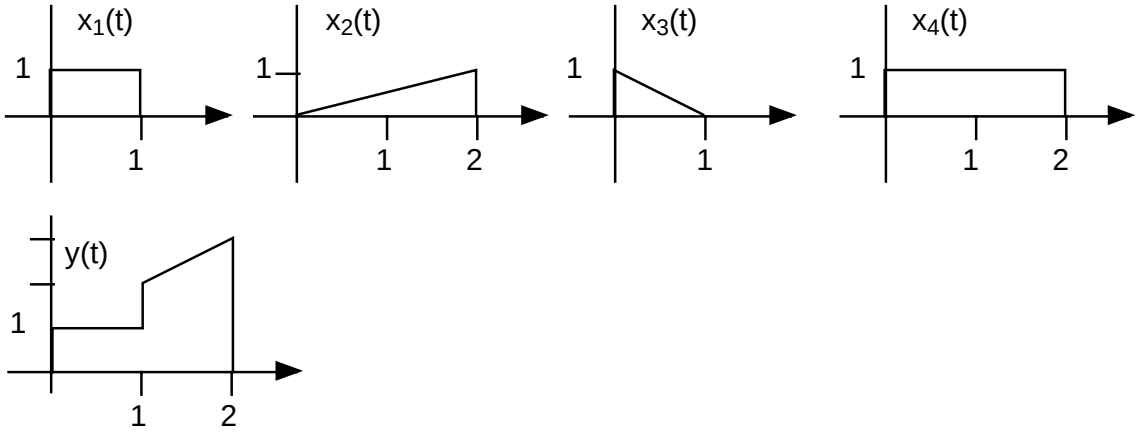
5. Let x(t) and y(t) be as shown below. Find numbers a and T such that y(t) = a x(t-T)



6. For the signals shown below, find numbers a_1, a_2, a_3, a_4 such that

$$y(t) = a_1 x_1(t) + a_2 x_2(t) + a_3 x_3(t) + a_4 x_4(t) .$$

(The a_i's can be positive, negative or zero.)



7. Consider the simple averaging/smoothing filter such that when the input signal is x(t), the output signal is

$$y(t) = \frac{1}{2} \int_{t-2}^{t} x(s)\ ds$$

Find an expression for y(t) when x(t) = sin(3t).

8. 2.1, p. 43

9. 2.3, p. 43

Homework submission policies:

Write neatly and legibly. The graders will not grade papers that are illegible or difficult to read.

Submit the problems in the assigned order.

Clearly write your name, lecture session number, and lab session number at the top of your paper.

Staple your paper in the upper left corner.

Hand in your homework before the start of the lecture to which you are registered, i.e. before 10:40 or 2:40.

See the collaboration policy described on the first day handout and on the website.