# Homework II

I. REMARK

- Reading materials: Ch 1-5 in the textbook.
- "Can not see the wood for the trees!!"

1) A system is described by the block diagram in Figure E.25.
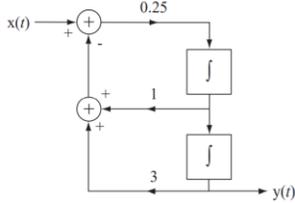
Figure E.25
A system

Classify the system as to homogeneity, additivity, linearity, time-invariance

2) Graph $g[n]$. Verify with the MATLAB `conv` function.
   (a) $g[n] = (u[n+1] - u[n-2]) * \sin(2\pi n/9)$
   (b) $g[n] = (u[n+2] - u[n-3]) * \sin(2\pi n/9)$

3) What function convolved with $-2\cos(t)$ would produce $6\sin(t)$? (There is m than one correct answer.)

4) Find the impulse response $h[n]$ of the system in Figure E.36.
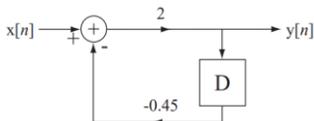
Figure E.36 System block diagram

5) These four rectangle functions are convolved in pairs (including a rectangle function being convolved with itself). The convolutions are illustrated below. For each convolution, determine which rectangle functions were convolved to produce each graph.

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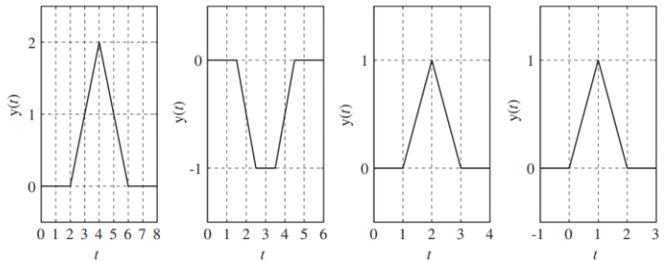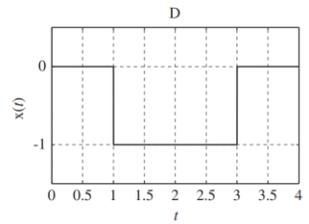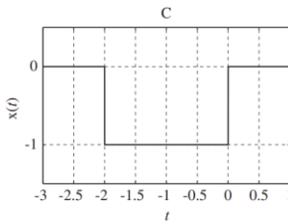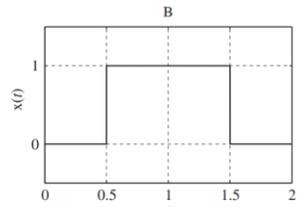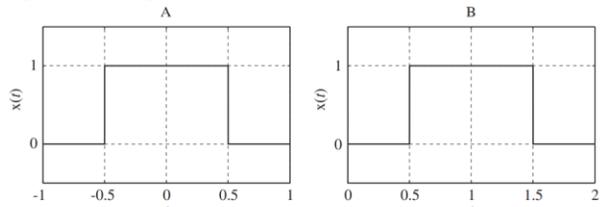
6) Non-textbook problem: You recorded your voice for the last assignment. Assume that the sampling rate of the recorded file is fs (Hz). Let the voice signal be $x[n]$ where n is the sample index starting 0. Plot the signals using MATLAB:
   (a) $y[n] = x[2n]$
   (b) $y[n] = x[n/2] * h[n]$ where $h[n] = \delta[n] + \delta[n-1]$

   Make new sound files using (a) and (b) using the sampling rate fs in MATLAB and listen them. Interpret your results.