

Homework I

I. REMARK

- Reading materials: Ch 1-3 in the textbook.
- The problems were chosen in textbook sections (exercises without answers). FYI.
- “Well begun is half done!!”

II. PROBLEM SET

- 1) Graph these functions.

(a) $g(t) = u(t) - u(t-1)$ (b) $g(t) = \text{rect}(t-1/2)$

(c) $g(t) = -4 \text{ramp}(t) u(t-2)$ (d) $g(t) = \text{sgn}(t) \sin(2\pi t)$

(e) $g(t) = 5e^{-t/4} u(t)$ (f) $g(t) = \text{rect}(t) \cos(2\pi t)$

- 2) A signal occurring in a television set is illustrated in Figure E.36. Write a mathematical description of it.

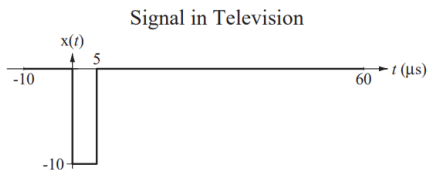
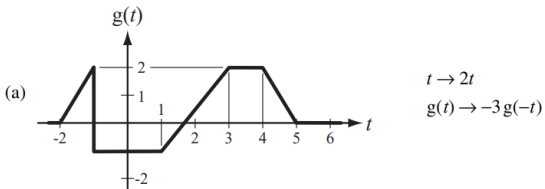
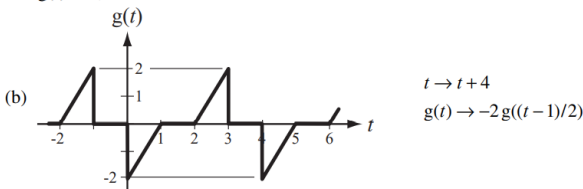


Figure E.36 Signal occurring in a television set

- 3) Given the graphical definition of a function in Figure E.42, graph the indicated shifted and/or scaled versions.



$$g(t) = 0, \quad t < -2 \text{ or } t > 6$$



$g(t)$ is periodic with fundamental period, 4

Figure E.42

- 4) What is the numerical value of each of the following integrals?

(a) $\int_{-\infty}^{\infty} \delta(t) \cos(48\pi t) dt$ (b) $\int_{-\infty}^{\infty} \delta(t-5) \cos(\pi t) dt$

$$(c) \int_0^{20} \delta(t-8) \text{rect}(t/16) dt$$

- 5) Find and graph the even and odd parts of the function $x(t)$ in Figure E.54.

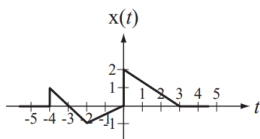


Figure E.54

- 6) Using MATLAB, for each function below graph the original function and the shifted and/or scaled function.

$$(a) \quad g[n] = \begin{cases} 5, & n \leq 0 \\ 5 - 3n, & 0 < n \leq 4 \\ -23 + n^2, & 4 < n \leq 8 \\ 41, & n > 8 \end{cases} \quad g[3n] \text{ vs. } n$$

(b) $g[n] = 10 \cos(2\pi n/20) \cos(2\pi n/4)$ $4g[2(n+1)]$ vs. n

(c) $g[n] = |8e^{j2\pi n/16} u[n]|$ $g[n/2]$ vs. n

- 7) Using MATLAB, graph each of these functions. If a function is periodic, find the period analytically and verify the period from the graph.

(a) $g[n] = \sin(3\pi n/2)$

(b) $g[n] = \sin(2\pi n/3) + \cos(10\pi n/3)$

- 8) Non-textbook problem: Record and save your voice using your smart-phone or laptop. During recording, say “저는 ***입니다”. Load the record file using MATLAB. Graph your voice signal using the ‘plot’ function. The horizontal axis must show time in sec or msec (not just index 0,1,...). What is the sampling rate (Hz) of your voice signal?