GEORGIA INSTITUTE OF TECHNOLOGY
School of Electrical and Computer Engineering

ECE 4270
Fundamentals of Digital Signal Processing

Assigned: Thursday, Jan. 26, 2017
Due: Thursday, Feb. 2, 2017

Problem Set #3

Note that all the problems are from the **Second** edition of Oppenheim and Schafer.

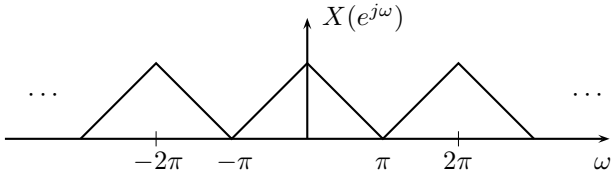
Problem 3.1: Work Oppenheim and Schafer Problem 2.41 on page 80.

Problem 3.2: Work Oppenheim and Schafer Problem 2.67 on page 87.

Problem 3.3: Work Oppenheim and Schafer Problem 2.84 on page 91.

Problem 3.4: Work Oppenheim and Schafer Problem 2.85 on page 91.

Problem 3.5: Let $x[n]$ and $X(e^{j\omega})$ represent a sequence and its Fourier transform, respectively. Determine, in terms of $X(e^{j\omega})$, the transforms of $y_s[n]$, $y_d[n]$ and $y_e[n]$. In each case sketch $Y(e^{j\omega})$ for $X(e^{j\omega})$ as shown in the following figure.



(a) Sampler:

$$y_s[n] = \begin{cases} 0, & n \text{ even} \\ x[n], & n \text{ odd} \end{cases}$$

Note that $y_s[n] = \frac{1}{2}\{x[n] - (-1)^n x[n]\}$ and $-1 = e^{j\pi}$.

(b) Compressor:

$$y_d[n] = x[2n+1]$$

(c) Expander:

$$y_e[n] = \begin{cases} 0, & n \text{ even} \\ x[\frac{n-1}{2}], & n \text{ odd} \end{cases}$$

Problem 3.6 (Optional): Work Oppenheim and Schafer Problem 2.44 on page 80.