Exercise Lesson 12

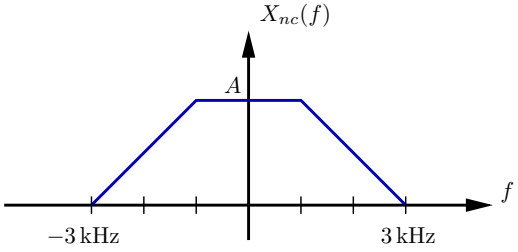
Problems from the compendium:

6.1a, 6.1c, 6.2, 6.3a,
6.4, 6.7a, 6.9a, 6.8

Other problems:

12.1 Assume a communication system employing binary PAM modulation with equally likely signal alternatives. The combination of the transmit pulse $g(t)$, channel filter $h(t)$, and receiver filter $v(t)$ can be written as $x(t) = g(t) * h(t) * v(t)$. The signal is sampled in the receiver at time instants $\mathcal{T} + i\,T_s$, $i = 0, 1, 2, \ldots$.

The Fourier transform $X_{nc}(f)$ of the non-causal pulse $x(\mathcal{T} + t)$ is given as follows:



(a) Determine the maximum possible symbol rate R_s that can be achieved so that there is no intersymbol interference (ISI). How should A be chosen in this case?

(b) Assume now that $R_s = 2000$ symbols per seconds and draw the signal

$$\sum_{n=-\infty}^{\infty} X_{nc}(f - nR_s)$$

within the range $-9\,\text{kHz} < f < 9\,\text{kHz}$. The amplitude A is chosen as in (a). Is the Nyquist condition for ISI-free reception satisfied in this case?