

EE354 Homework #3

Note: Lathi uses different definitions for the sinc and unit triangle functions. See Chapter 3.

1. Lathi 6.1-2
2. Lathi 6.1-5
3. Given the following signal: $s(t) = \cos(2\pi(100\text{Hz})t)\cos(2\pi(30\text{Hz})t)$
 - (a) Determine the frequencies present in the spectrum of $s(t)$.
 - (b) If $s(t)$ is sampled at a rate of f_s , determine the minimum sampling frequency required to prevent distortion.
 - (c) If $f_s = 150\text{ Hz}$, and the sampled signal is passed through a low-pass filter with cutoff of $f_{co} = 100\text{ Hz}$, determine the frequencies present in the output spectrum.
4. A 60 Hz signal is sampled at a rate of f_s times per second, and the sampled signal has a frequency component at 10 Hz.
 - a) Determine all possible values of f_s that are greater than 20 Hz.
 - b) If the sampler is followed by an ideal low-pass filter with a cutoff of 50 Hz, determine the values of f_s for which there is **only** a 10 Hz signal at the output of the filter.
5. A signal is given by: $s(t) = \frac{\sin(5\pi t)}{\pi t} + \frac{\sin(10\pi t)}{\pi t}$, and is impulse sampled.
 - (a) Determine the Nyquist sampling rate.
 - (b) If sampling is performed at the Nyquist rate, sketch the spectrum of the sampled signal.