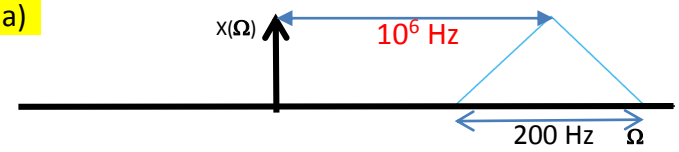
1. Determine a suitable sampling frequency for the signals with the following Fourier transforms:

(a)



(b) $x(t)= \sin(100\pi x)/x + 2\sin(200\pi x)/x$

2. A signal $f(t) = e^{-j(140\pi t)}$ was sampled with an ideal pulse train. Sketch the continuous-time Fourier transformation for the following values of the sampling rate and estimate the reconstructed signal using a lowpass filter with cutoff frequency of $\Omega_s/2$:

(a) f_s= 1k Samples/s
(b) f_s= 100 Samples/s

3. For the following CT signals, calculate the maximum sampling period T_s that produces no aliasing:

(a) $x_1(t) = 5\ \mathrm{sinc}(200t)$;
(b) $x_2(t) = 5\ \mathrm{sinc}(200t) + 8\sin(100\pi t)$;
(c) $x_3(t) = 5\ \mathrm{sinc}(200t)\sin(100\pi t)$;
(d) $x_4(t) = 5\ \mathrm{sinc}(200t) * \sin(100\pi t)$, where $*$ denotes the CT convolution operation.

4. (Problem 8.14 in textbook)

Consider the periodic signals

$$x_1(t) = \cos(2\pi t), \quad x_2(t) = \cos((2\pi + \phi)t)$$

(a) Let $\phi = 4\pi$, show that if we sample these signals using $T_s = 0.5$ we get the same sample values from the two signals. Is any of these signals aliased? Explain.

(b) What would be possible values of ϕ so that when using $T_s = 0.5$ we get the same sample values from the two signals? How does ϕ relate to the sampling frequency Ω_s?

- *Assigned*: Sunday June 28, 2015
- *Deadline*: Thursday July 2, 2015