ECS 332: In-Class Exercise # 20 - Sol

Instructions

1. Separate into groups of no more than three students each. **The group cannot be the same as any of your former groups after the midterm.**
2. Write down all the steps that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
3. **Do not panic.**

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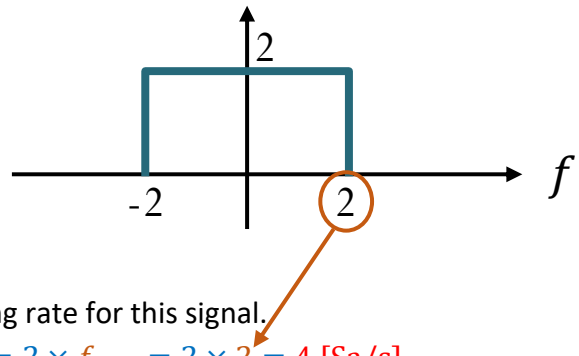
Consider a continuous-time signal $g(t)$ whose **Fourier transform** is plotted below.



(a) Find the Nyquist sampling rate for this signal.

Nyquist sampling rate $= 2 \times f_{max} = 2 \times 2 = 4$ [Sa/s]

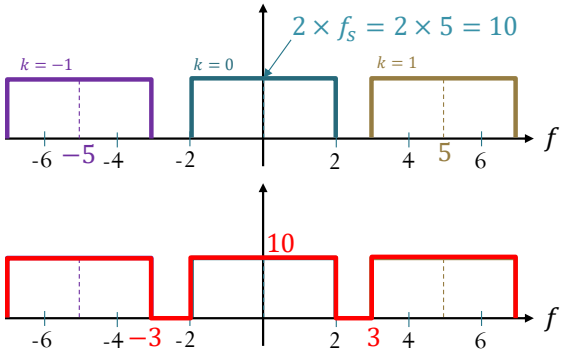
Note that f_{max} is NOT the frequency at which the spectrum is maximum.

Mathematically, $f_{max} = \max\{f : G(f) \neq 0\}$.

(b) The ideal sampled signal $g_\delta(t)$ is defined by $g_\delta(t) = \sum_{n=-\infty}^{\infty} g[n]\,\delta(t - nT_s)$ where T_s is the sampling interval.

Plot the **Fourier transform** of $g_\delta(t)$ from $f = -6$ to $f = 6$.

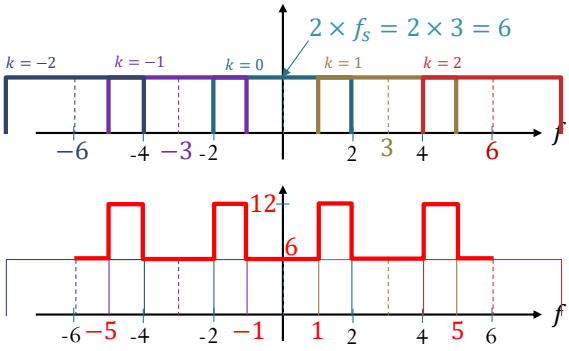
a. when T_s = 1/5



$$G_\delta(f) = \sum_{k=-\infty}^{\infty} f_s G(f - kf_s)$$

Only $f_s G(f - kf_s)$ for $k = -1, 0, 1$ are shown here. The contribution from other k values are outside of this specified freq. range.

b. when T_s = 1/3



$$G_\delta(f) = \sum_{k=-\infty}^{\infty} f_s G(f - kf_s)$$

Only $f_s G(f - kf_s)$ for $k = 0, \pm 1, \pm 2$ are shown here. The contribution from other k values are outside of this specified freq. range.