EES 351: In-Class Exercise # 21

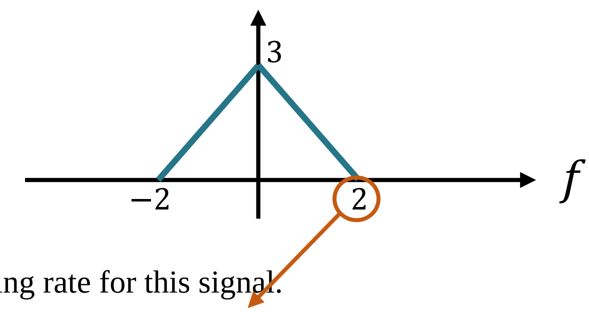
Instructions

1. Work alone or in a group of no more than three students. **The group cannot be the same as any of your former groups after the midterm.**
2. Only one submission is needed for each group.
3. You have two choices for submission:
   (a) Online submission via Google Classroom
   - PDF only.
   - Only for those who can directly work on the posted files using devices with pen input.
   - Paper size should be the same as the posted file.
   - No scanned work, photos, or screen capture.
   - Your file name should start with the 10-digit student ID of one member. (You may add the IDs of other members, exercise #, or other information as well.)

   (b) Hardcopy submission
4. **Do not panic.**

Date: 25 / 11 / 2020			
Name	ID (last 3 digits)		

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.

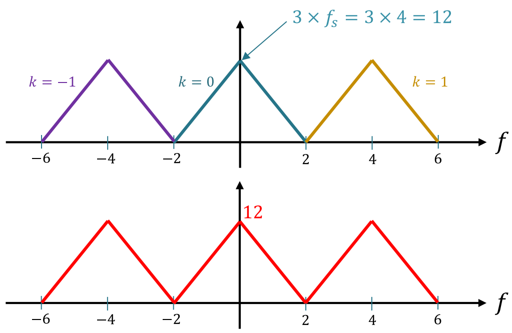
Mathematically, $f_{max} = \max\{f : G(f) \neq 0\}$.

(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 $f = 6$.

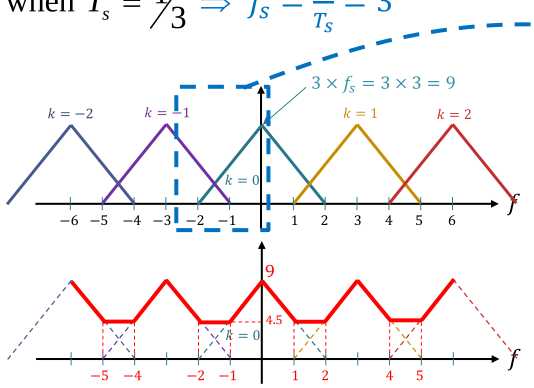
a. when $T_s = 1/4 \Rightarrow f_s = \frac{1}{T_s} = 4$



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

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 $T_s = 1/3 \Rightarrow f_s = \frac{1}{T_s} = 3$



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

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.