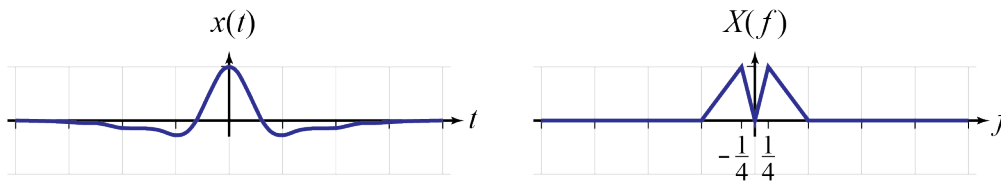**TOOL:** The M-shaped spectrum is a generic, band-limited spectrum that may stand in for audio signals or other signals that roll off at low frequency and above some cutoff frequency.

$$X(f) = \begin{cases} \frac{4}{3}(f+1) & -1 \le f \le -\frac{1}{4} \\ -4f & -\frac{1}{4} \le f \le 0 \\ 4f & 0 \le f \le \frac{1}{4} \\ -\frac{4}{3}(f-1) & \frac{1}{4} \le f \le 1 \\ 0 & \text{otherwise} \end{cases}$$

The spectrum may be expressed in terms of triangle (or Lambda) functions:

$$X(f) = \frac{4}{3}\Lambda(f) - \frac{4}{3}\Lambda(4f).$$

The time-domain waveform may, likewise, be expressed in terms of sums of sinc^2 functions:

$$x(t) = \frac{4}{3}\text{sinc}^2(t) - \frac{1}{3}\text{sinc}^2(t/4).$$

This formula was verified by comparing with direct integration:

DSP Rosetta Stone method: Spectra: Band-limited: M shape