

The following two figures show the "Fourier construction" of a periodic, bipolar, unitamplitude triangle wave. The waveforms in these figures were generated using truncated, finite-term version(s) of the Fourier series expansion for this waveform:

$$f(\theta)|_{\substack{\text{triangle} \\ -wave}} = 2\sum_{m=1}^{m=\infty} (-1)^{m-1} \left(\frac{2}{(2m-1)\pi}\right)^2 \sin[(2m-1)\theta] = \frac{8}{\pi^2} \left\{ \sin \theta - \frac{1}{9} \sin 3\theta + \frac{1}{25} \sin 5\theta - \frac{1}{49} \sin 7\theta + \dots \right\}$$

The first figure shows the bipolar triangle wave (labelled as "Waveform") overlaid with three other waveforms: that associated with just the fundamental ("n = 1"), then the waveform associated with fundamental +  $3^{rd}$  harmonic ("n = 1:3"), then the waveform associated with fundamental +  $3^{rd} + 5^{th}$  harmonic ("n = 1:5").



## Fourier Construction of a Bipolar Triangle Wave

©Professor Steven Errede, Department of Physics, University of Illinois at Urbana-Champaign, IL, 2000 - 2017. All rights reserved