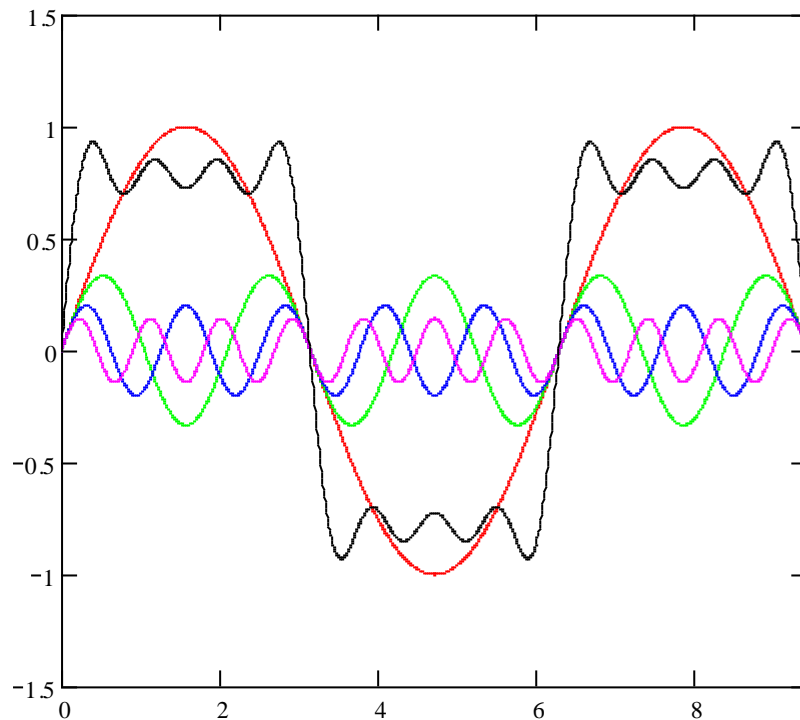


This group of waveforms show the most 'famous' of the Fourier type waveforms. It shows that a square wave is made up from a fundamental waveform and all the odd harmonics of the fundamental. Here I have shown the harmonics up to the 7<sup>th</sup>.



Red waveform = the fundamental  $\sin(x)$

Green waveform = the third harmonic  $\frac{\sin(3x)}{3}$

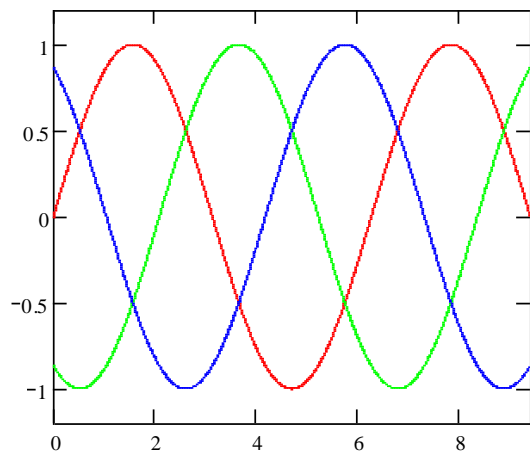
Blue waveform = the fifth harmonic  $\frac{\sin(5x)}{5}$

Violet waveform = the seventh harmonic  $\frac{\sin(7x)}{7}$

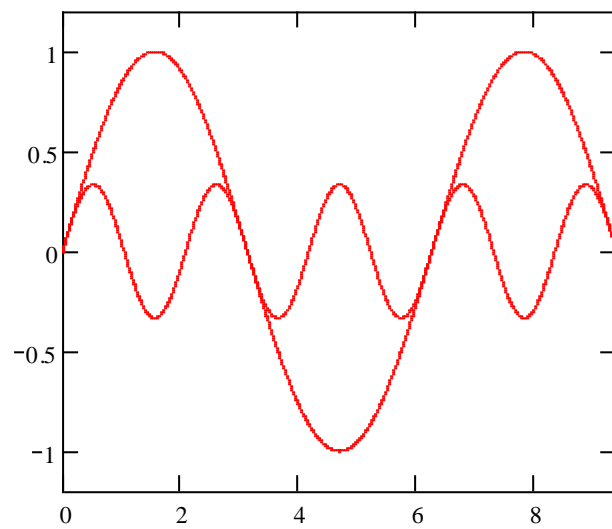
Black waveform is the resultant of  $\sin(x) + \frac{\sin(3x)}{3} + \frac{\sin(5x)}{5} + \frac{\sin(7x)}{7}$

This gives a general idea on how Fourier analysis works. Any repeating waveform can be shown to consist of a DC level, a fundamental and the harmonics of the fundamental. If the waveform is symmetrical around the 0 line there will be no DC component.

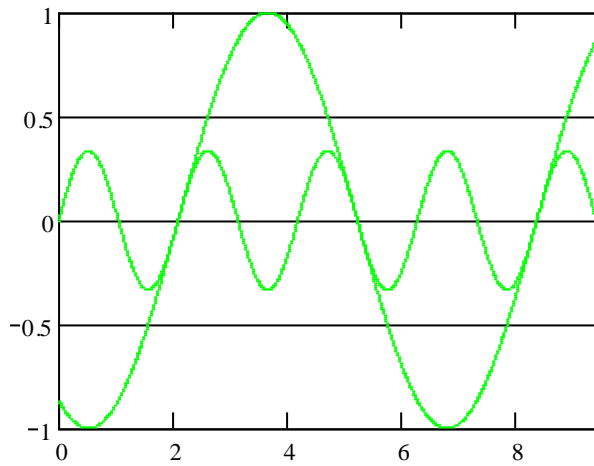
3<sup>rd</sup> Harmonics.



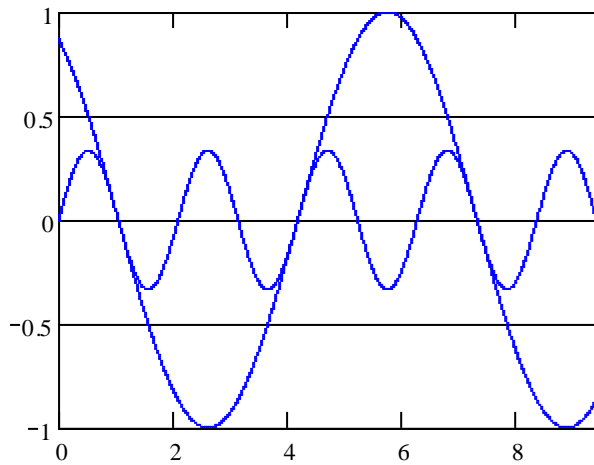
Here we have the standard three phase waveforms.



Here we have the Red phase (phase A) fundamental and the associated third harmonic for this waveform.

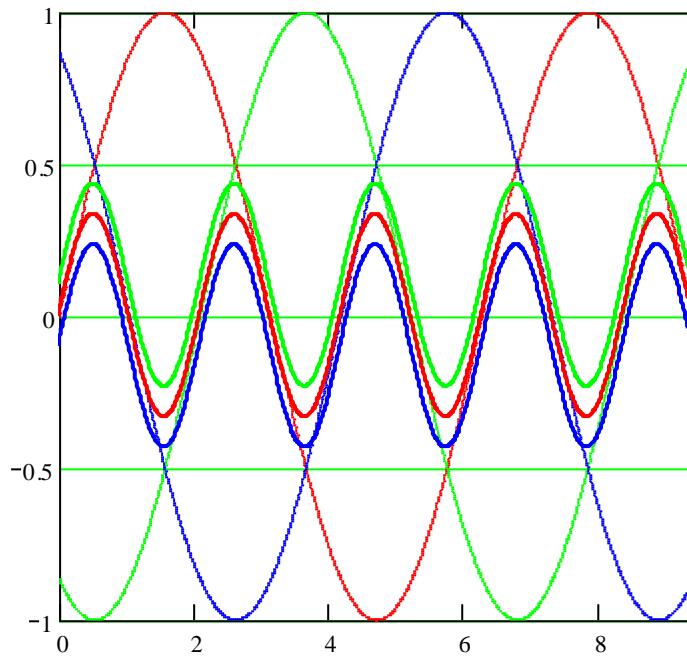


Here we have the White phase (phase B) fundamental and the associated third harmonic for this waveform.



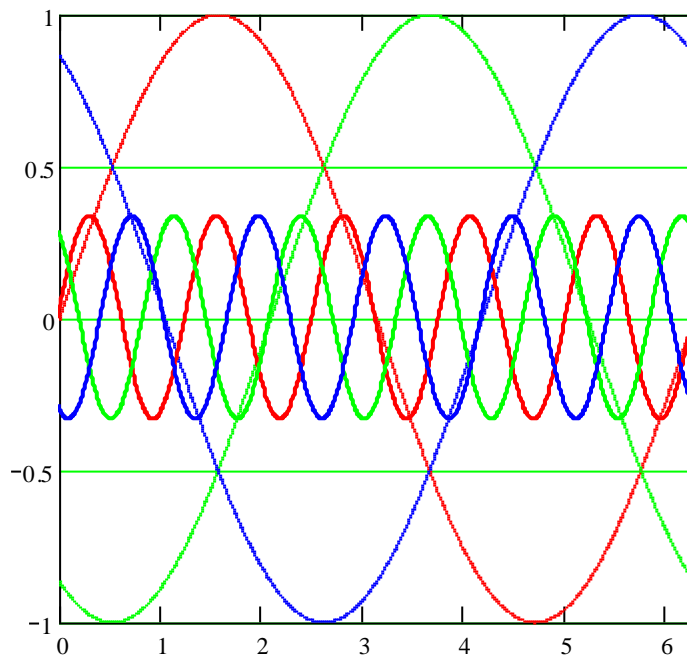
Here we have the White phase (phase C) fundamental and the associated third harmonic for this waveform.

You will notice that for all the three waveforms above the third harmonic all starts at the (0,0) point on the graph and are identical for all three graphs.

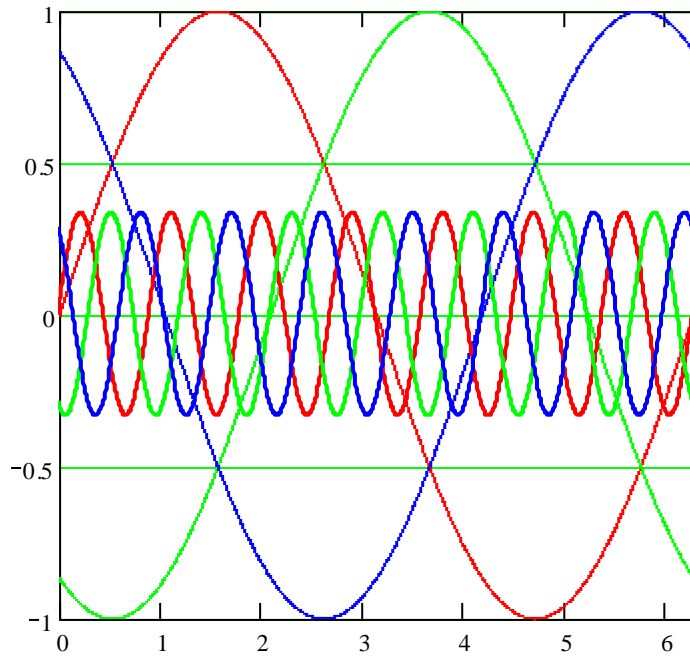


In this graph all three phases are shown along with their associated third harmonic..I have slightly offset the third harmonics for phases B and C, B phase slightly up and C phase slightly down. The third harmonics are identical for all three phases and will cover each other. As they are all in phase with each other they are termed 0 sequence harmonics.

It is because of the fact that the third harmonic is the same for all three phases, is the reason that these currents add up in the neutral.



This series of waveforms show the fifth harmonic . As can be seen they are not in phase with each other and the phase sequence is different from the Fundamental. The Fundamental has a phase sequence A-B-C, whilst the 5<sup>th</sup> harmonic has the phase sequence A-C-B. This makes the 5<sup>th</sup> harmonic a negative sequence harmonic.



This series of waveforms show the seventh harmonic . As can be seen they are not in phase with each other and the phase sequence is the same as the Fundamental. The Fundamental has a phase sequence A-B-C, whilst the 7<sup>th</sup> harmonic also has the phase sequence A-B-C. This makes the 7<sup>th</sup> harmonic a positive sequence harmonic.