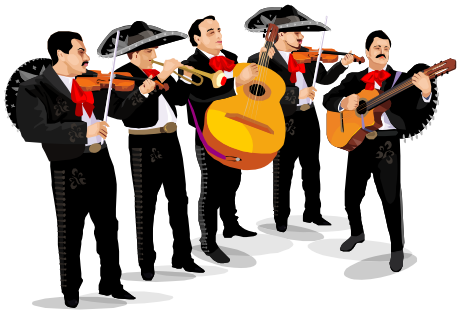
Chapter 5 Web Task

Music and Math

A stringed instrument such as a guitar or violin does not play a pure note. Rather, it plays a sum of harmonics. This can be illustrated by adding the functions $f(x) = \sin x$, $g(x) = \frac{1}{3}\sin 3x$, $h(x) = \frac{1}{5}\sin 5x$, and so on. These are called the first, third and fifth harmonics.



a) How are the functions $f(x)$, $g(x)$, and $h(x)$ related?

b) Use technology to graph the sum of these three harmonics for $x \in (-2\pi,\ 2\pi)$.

c) Sketch and label a graph of the resultant function in your notebook.

d) How does the graph of the sum of the second, fourth and sixth harmonic compare to your graph from part b)?

e) Conjecture how many harmonics would be needed for the wave to appear "square". Justify your conjecture using technology, and include a screen shot of your square wave.