

9. Modelling Beats (MM3/4)

(KP:2.2;4.3;5.1;5.3)

Beats are a phenomenon in music when a person hears two 'pure' notes simultaneously that differ in frequency by a small amount. The beat is perceived audibly as a low frequency sound. The beat frequency is one half the difference of the two frequencies. This phenomena is due to constructive and destructive interference. It is used by musicians to tune instruments.



1. To model beats, graph two sine functions, each with amplitude 1, but with different frequencies of 8 and 10 cycles per second. View them in the window $[0,1]$ by $[-2,2]$
2. Enter and plot a function, Y_3 , which is the sum of the sine functions in Question 1. Note that where the graphs are in phase there is constructive interference, and where they are out of phase there is destructive interference.
3. Find two functions, Y_4 and Y_5 , which envelop the graph of Y_3 .

(Note - In general, the envelope of the sum of 2 sine curves with amp = A and freq. f_1 and f_2 where $f_2 > f_1$ is a cosine curve with amplitude $2A$ and beat frequency $(f_2 - f_1)/2$.)

Note: This task provides a context for examining a phenomenon in which the addition of ordinates technique is a key feature. In addition, the task introduces the notion of an 'envelope' curve.