

Given freqs f_1, f_2

What is the musical interval between them in semitones?

In cents?

Given freqs. f_1, f_2 ,

what is beat freq?

When is it heard?

What freq. does the beat modulate?

Explain difference between timbre & amplitude

What is the dB for intensity 10^{-3} W/m^2 ?

$$e^{-t/3} \sin(200\pi t)$$

What is the Q-factor?

frequency of $\sin(100t)$?

If $T = 0.01$ what is ω
(angular freq.)

What is the wavelength of a sinusoid at 200 Hz ?

Compute freq of D#2

What is freq. of sound with wavelength 10 cm ?

$$\text{beat freq.} = |f_2 - f_1|$$

hear if its less than 15 Hz

$\frac{f_1 + f_2}{2}$ is the freq. which is modulated by beats.

$$\text{dB} = 10 \log_{10} \frac{10^{-3}}{10^{-12}} = 90 \text{ dB}$$

$$\omega = 100$$

$$\text{so } f = \frac{\omega}{2\pi} = \frac{100}{2\pi} = \frac{50}{\pi}$$

$$\omega = \frac{2\pi}{T}$$

2 octaves + 6 semitones
below A4

$$\rightarrow f = \frac{440}{2^{2+3}} = 77.8 \text{ Hz}$$

$$\text{semitone } n = 12 \frac{\ln(f_2/f_1)}{\ln 2}$$

$$\text{cents } c = 1200 \frac{\ln(f_2/f_1)}{\ln 2}$$

amplitude = $A \sin A t$
or single c_j in Fourier series
→ controls loudness of a sound

timbre = relative strengths of c_j ,
harmonic content.
{ Ia strong vs. weak high harmonics.
" eg harsh/mellow.

read off:

$$\tau = 3$$

$$\omega = 200\pi \quad \text{so } T = \frac{1}{f} = \frac{2\pi}{\omega} = 0.01$$

$$Q = \pi \frac{\tau}{T} = 300\pi$$

$$c = f \lambda$$

$$\text{so } \lambda = \frac{c}{f} = \frac{340}{200} = 1.7 \text{ m}$$

$$f = \frac{c}{\lambda} = \frac{340}{0.1} = 3400 \text{ Hz.}$$