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?

what condition on f_1, f_2 causes hea

what do you hear if this condit
not satisfi

Explain difference between timbre & amplitude

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

How far away does a trumpet of 0.3W acoustic power need to be so that intensity is 80dB?

frequency of $\sin(100t)$?

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

What is the wavelength of a sinusoid at 200Hz?

What is freq. of sound with wavelength 10cm?

Compute freq of D#2

beat freq $= |f_2 - f_1|$

hear if it's less than 15Hz
Otherwise hear 2 separate tones.

semitones $n = 12 \dfrac{\ln(f_2/f_1)}{\ln 2}$

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

$dB = 10 \log_{10} \dfrac{10^{-3}}{10^{-12}} = 90\,dB$

amplitude = A in $A\sin\omega t$
(or single c_j in Fourier series.
↳ controls loudness of a sound

timbre = relative strengths of c_j, harmonic content.
↳ ie strong vs. weak high harmonics
eg harsh / mellow.

$\omega = 100$

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

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

$80 = 10 \log_{10} \dfrac{I}{10^{-12}}$

solve for I: $10^8 = \dfrac{I}{10^{-12}}$

$I = 10^{-4}\ W/m^2$

Then $I = \dfrac{P}{4\pi r^2}$ so $r = \sqrt{\dfrac{P}{4\pi I}}$

$= \sqrt{\dfrac{0.3}{4\pi \times 10^{-4}}} = 15.5\,m$ ans

4½ octaves + 6 semitones below A4

$\Rightarrow f = \dfrac{440}{2^{\frac{54}{12}}} = 77.8\ Hz$

$c = f\lambda$

so $\lambda = \dfrac{c}{f} = \dfrac{340}{200}$

$= 1.7\,m$

$f = \dfrac{c}{\lambda} = \dfrac{340}{0.1} = 3400\,Hz.$