Music 170 Formulas for test 3

Phase of a sinusoid: $\phi(t) = 2\pi f t + \phi_0$

Formula for a sinusoid: $x(t) = a\cos(2\pi f t + \phi_0)$

Average power and RMS power of a sinusoid with peak amplitude a:

$$\text{average power} = a^2/2$$

$$\text{RMS power} = a/\sqrt{2}$$

Frequency and period: $f = 1/\tau$

Pitch intervals in octaves (I) and half steps (H):

$$H = 12I = 12\log_2\left(\frac{f}{f_{\text{ref}}}\right)$$

Levels (dB) from amplitude and power ratios:

$$L = 20\cdot\log_{10}\left(\frac{a}{a_{\text{ref}}}\right) = 10\cdot\log_{10}\left(\frac{P}{P_{\text{ref}}}\right)$$

The log to the base 10 of 2 is about 0.3.

Frequency and wavelength: $\lambda = c/f$ (where λ is the wavelength, f is frequency, and c is the speed of sound).

Doppler shift as a function of speed of an object

$$\text{Doppler shift} = \frac{1}{1 - s/c}$$

(where s is the speed at which the object is moving toward the listener.)

Intensity of sound from an omnidirectional souurce as a function of power and distance:

$$I = \frac{w}{4\pi r^2}$$