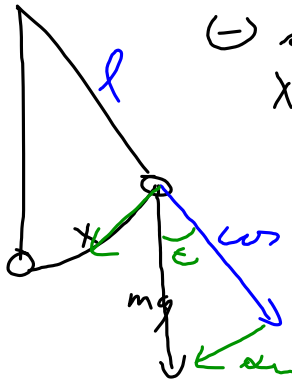


θ small ($< 15°$)

x = linear

l

$\cos\theta\, mg$

θ

mg

$\sin\theta\, mg$

$F_{restoring} = mg\sin\theta$

θ or $\sin\theta$

$F = mg\theta$ ← $\theta = \frac{x}{L}$

$F = \frac{mgx}{L}$

$F = kx$

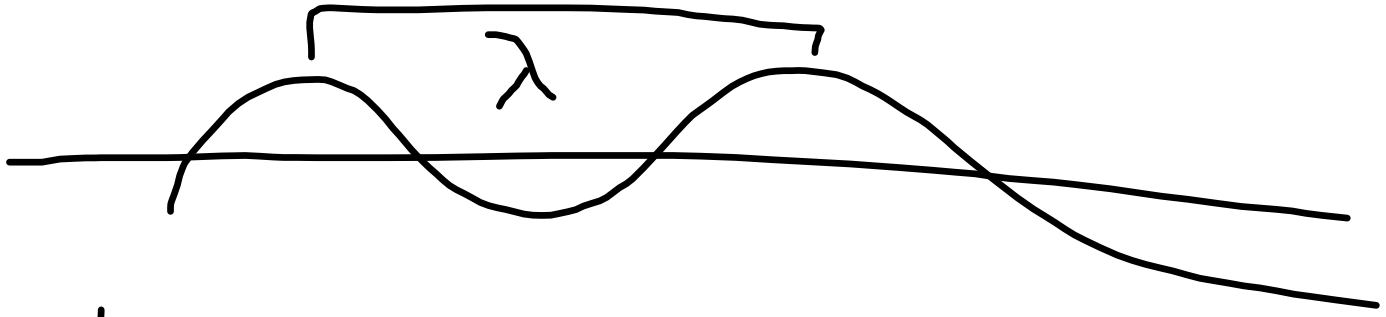
$Kx = \frac{mgx}{L}$

or $K = mg/L$

$T = 2\pi\sqrt{m/K}$

$T = 2\pi\sqrt{\frac{m}{mg/L}}$

$T = 2\pi\sqrt{L/g}$



frequency = waves/sec

s^{-1} (Hz)

$v = f\lambda$

$v = \frac{\lambda}{T}$

Every wave has a "set" velocity in a particular substance!

solid

$$v = \sqrt{\frac{E}{\rho}}$$

fluid

$$v = \sqrt{\frac{B}{\rho}}$$

wire

$$v = \sqrt{\frac{F_T}{\mu}} = \sqrt{\frac{F_T}{m/L}}$$

(moo)

μ = "mass per unit of length"

H_2O sound

$$v = \sqrt{\frac{B}{\rho}} = \sqrt{\frac{2.0 \times 10^9 N/m^2}{1000 kg/m^3}}$$

$$v = 1400 m/s$$

in air $v = \sqrt{\frac{1.01 \times 10^5 N/m^2}{1.29 kg/m^3}}$

$$v = 280 m/s$$

in steel $v = \sqrt{\frac{E}{\rho}} = \sqrt{\frac{200 \times 10^9 N/m^2}{7800 kg/m^3}}$

$$v = 5100 m/s$$

$v = f\lambda$

sound

$v_s = 343\ m/s$

if $\lambda = 1.0\ m$

$f = ?$

$v = f\lambda$

$f = \frac{v}{\lambda} = \frac{343\ m/s}{1\ m}$

$f = 343\ Hz$

light

$v_l = 3.0 \times 10^8\ m/s$

$\lambda = 7 \times 10^{-7}\ m$ $v = f\lambda$

$f_r = ?$ $f = \frac{v}{\lambda}$

$f_r = \frac{3.0 \times 10^8\ m/s}{7 \times 10^{-7}\ m}$

$f_r = 4.3 \times 10^{14}\ Hz$