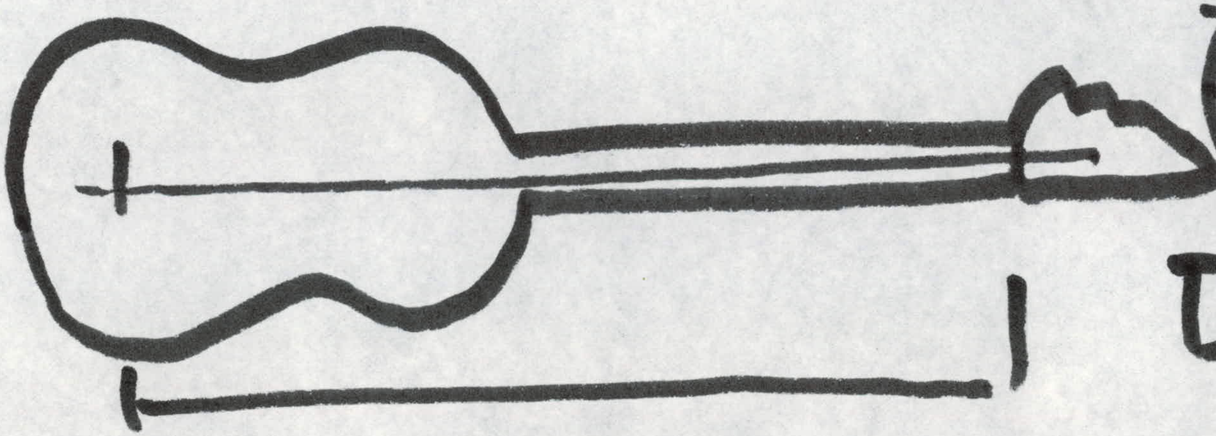
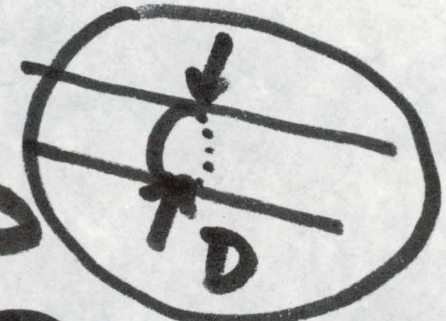




$D = 0.0254$ cm

$L = 0.65\,m$ $M = 2.5 \times 10^{-4}\ \cancel{g}\,kg$

$f = 340\ s^{-1}$

$$\cancel{2\pi \sqrt{\frac{T}{ML}} = f}$$

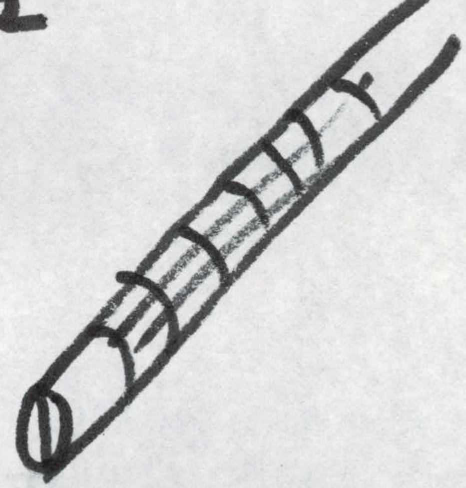
$$f = \frac{1}{2}\sqrt{\frac{T}{ML}}$$

$$\cancel{T = \frac{f^2}{4\pi^2} ML}$$

$$T = 4f^2 ML$$

$$T = 80\,N\,!$$

$$\underline{\text{Stress}}: \frac{\text{Force}}{\text{Area}} = \frac{80\,N}{\frac{\pi}{4} D^2}$$



$$A = \frac{\pi}{4} D^2 = \frac{3}{4} \cdot (2.5 \times 10^{-4} m)^2$$

$$= 5 \times 10^{-8}\ m^2$$

$$\text{Stress}: \frac{80\,N}{5 \times 10^{-8} m^2} = 1.6 \times 10^{9} \underbrace{N m^{-2}}_{Pa}$$

$$(1\ \text{atm} = 100\ kPa)$$

Stress is proportional to strain

$$P = E_m \frac{\Delta L}{L}$$ (only true for $\Delta L \ll L$)

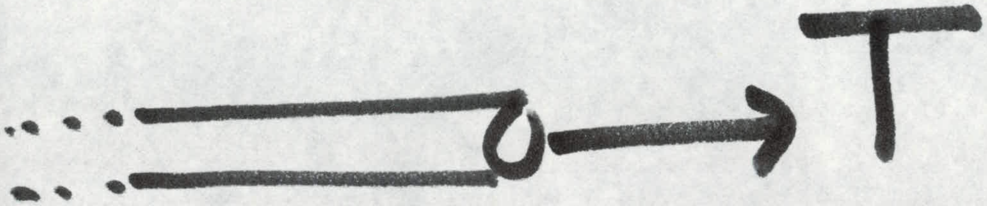
stress

strain — dimensionless distortion.

elastic modulus = 200 GPa

$$1.6\,\text{GPa} = 200\,\text{Gpa} \cdot \frac{\Delta L}{L}$$

$$\frac{\Delta L}{L} = 0.8 \times 10^{-2} \qquad \Delta L \approx 0.005\,\text{m} = 5\,\text{mm}$$



~~work~~ =

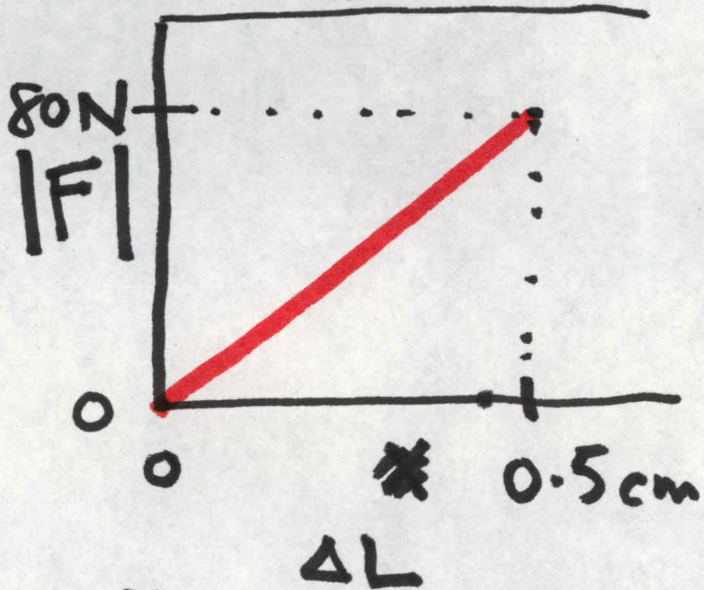
$$dWork = \vec{F} \cdot d\vec{x}$$

$$\underline{Work} = \int_{start}^{finish} \vec{F}(x) \cdot d\vec{x}$$

how we stretch the string

Hooke's Law $F = -k \Delta L$

ignore for now



$$W = \int_0^{\Delta L} F\,dx = \int_0^{\Delta L} kx\,dx = \frac{1}{2}kx^2 \Big|_0^{\Delta L} = \frac{1}{2}k(\Delta L)^2$$