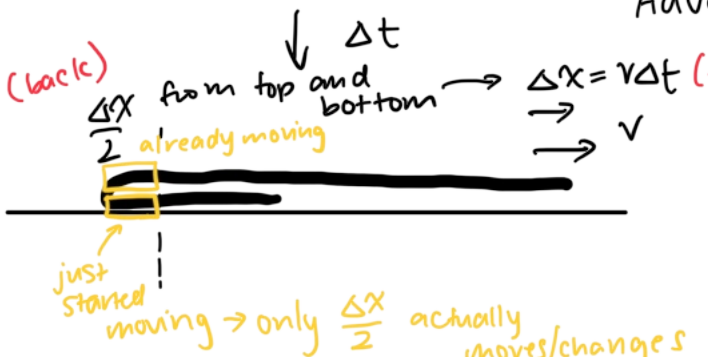
- A rug of linear mass density λ is folded over and pulled at a speed v. What force is required to do this?

$$\lambda = \frac{m}{L}$$

$$\lambda L = m$$

$$F = \frac{\Delta p}{\Delta t} = \frac{mv}{\Delta t}$$

Advance time by Δt



mass of string that starts to move

$$\Delta p = \lambda \frac{\Delta x}{2} \cdot v$$

$$= \lambda \frac{v\Delta t}{2} \cdot v$$

$$= \frac{\lambda v^2 \Delta t}{2}$$

$$F = \frac{\lambda v^2 \Delta t}{2\Delta t} = \frac{\lambda v^2}{2}$$