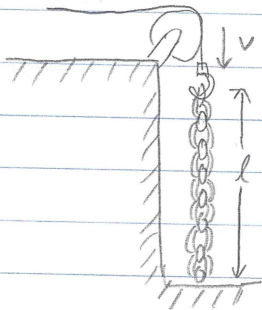


20-P-MOM-104-37

A heavy metal chain is lowered onto the floor at a constant velocity $v = 2 \text{ m/s}$. The chain has the density $\rho = 2 \text{ kg/m}$ and a length of $l = 10 \text{ m}$. Determine the normal force exerted by the floor as a function of time.



Solution: $\frac{dv}{dt} = 0$ $\frac{dm}{dt} = v\rho$

$$\sum F = m \frac{dv}{dt} + v \frac{dm}{dt} \Rightarrow v^2 \rho = N - \rho v t g$$

$$N = (v^2 + v t g) \rho = (8 + 139.24 t) \text{ N}$$