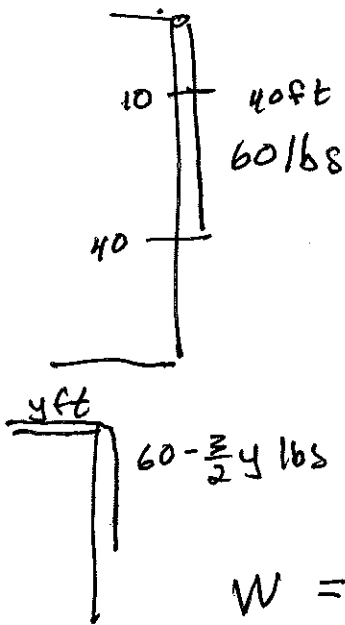


Rope Problem 7.4

A 40 ft, 60 lb rope hangs from a tall building. Find the work done if 10 ft of the rope are pulled to the top of the building.

The rope weighs $\frac{60 \text{ lb}}{40 \text{ ft}} = \frac{3}{2} \text{ lb/ft}$ assuming it is uniform.



When y ft have been pulled up the remaining rope weighs $60 - \frac{3}{2}y$ lbs.

This weight pulled up Δy ft does

$$\Delta W = (60 - \frac{3}{2}y) \Delta y \text{ ft-lbs of work}$$

$$W = \int_0^{10} (60 - \frac{3}{2}y) dy = 60y - \frac{3}{4}y^2 \Big|_0^{10}$$

$$= 600 - 75 = 525 \text{ ft-lbs.}$$