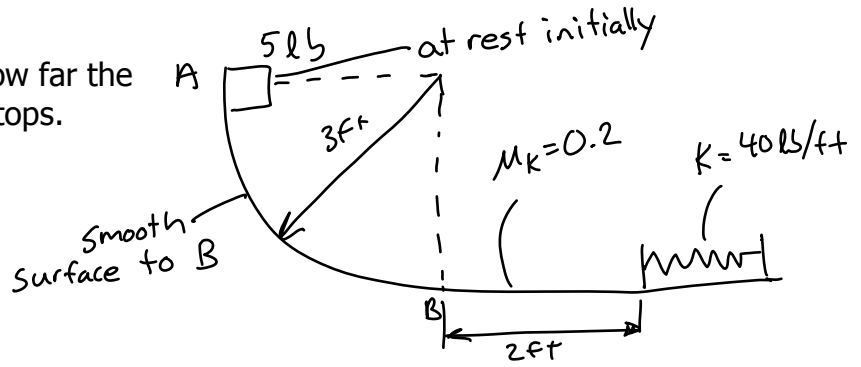
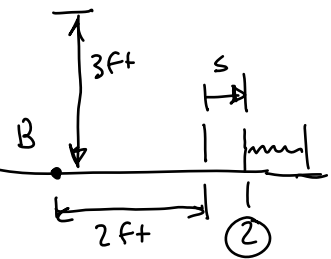
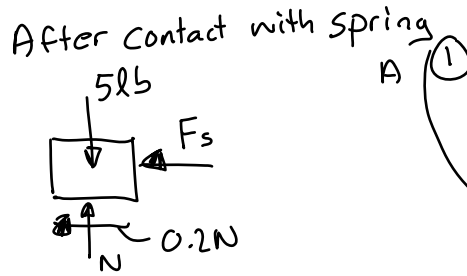
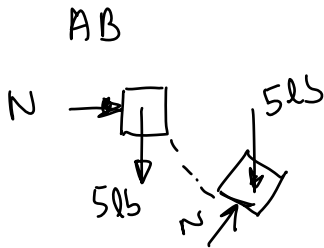


## Kinetics of a Particle: Work and Energy

**Problem Statement:** Determine how far the spring compresses before the block stops.



1.) Draw the Free-Body Diagram.



2.) Determine the work.

$$U_{\text{weight}} = (5 \text{ lb})(3 \text{ ft}) = 15 \text{ lb}\cdot\text{ft}$$

$$U_{\text{friction}} = -(0.2N)(2 \text{ ft} + s)$$

$$U_{\text{spring}} = -\frac{1}{2} k s^2 = -\frac{1}{2} (40 \text{ lb/ft}) s^2 = -20 s^2$$

3.) Determine the kinetic energy.

$$T_1 = 0$$

$$T_2 = 0$$

4.) Apply the Principle of Work and Energy.

$$0 + 15 \text{ lb}\cdot\text{ft} - (0.2N)(2 + s) - 20s^2 = 0$$

$$+\circlearrowleft \sum F = 0 \Rightarrow N = 5 \text{ lb}$$

$$15 - (0.2)(5)(2 + s) - 20s^2 = 0$$

$$\boxed{s = 0.781 \text{ ft}} \text{ or } \cancel{-0.232 \text{ ft}}$$

