Particle Work Energy: Example Problem 1

A 5 lb slider moves along a smooth rod in a vertical plane with an initial speed of 10 fps. Connected to it is a spring with a spring constant of 5 lb/ft and an unstretched length of 20 inch. When the slider reaches position 2, please determine its speed, $v_2$.

Spring: $k = 5 \text{ lb/ft}$
Unstretched length = $L_0 = 20 \text{ inch}$
Neglect the mass of the spring.
\[ v_1 = 10 \text{ fps} \]

5 lb slider
Smooth rod
Vertical plane

\[ 30 \text{ in} \]

\[ 40 \text{ in} \]

**Spring:** \( k = 5 \text{ lb/ft} \)

Unstretched length = \( L_0 = 20 \text{ inch} \)

Neglect the mass of the spring.
\[
\frac{1}{2}mv_1^2 + mgh - \frac{1}{2}k\left[s_2^2 - s_1^2\right] = \frac{1}{2}mv_2^2
\]

Spring: \( k = 5 \text{ lb/ft} \)
Unstretched length = \( L_0 = 20 \text{ inch} \)
Neglect the mass of the spring.