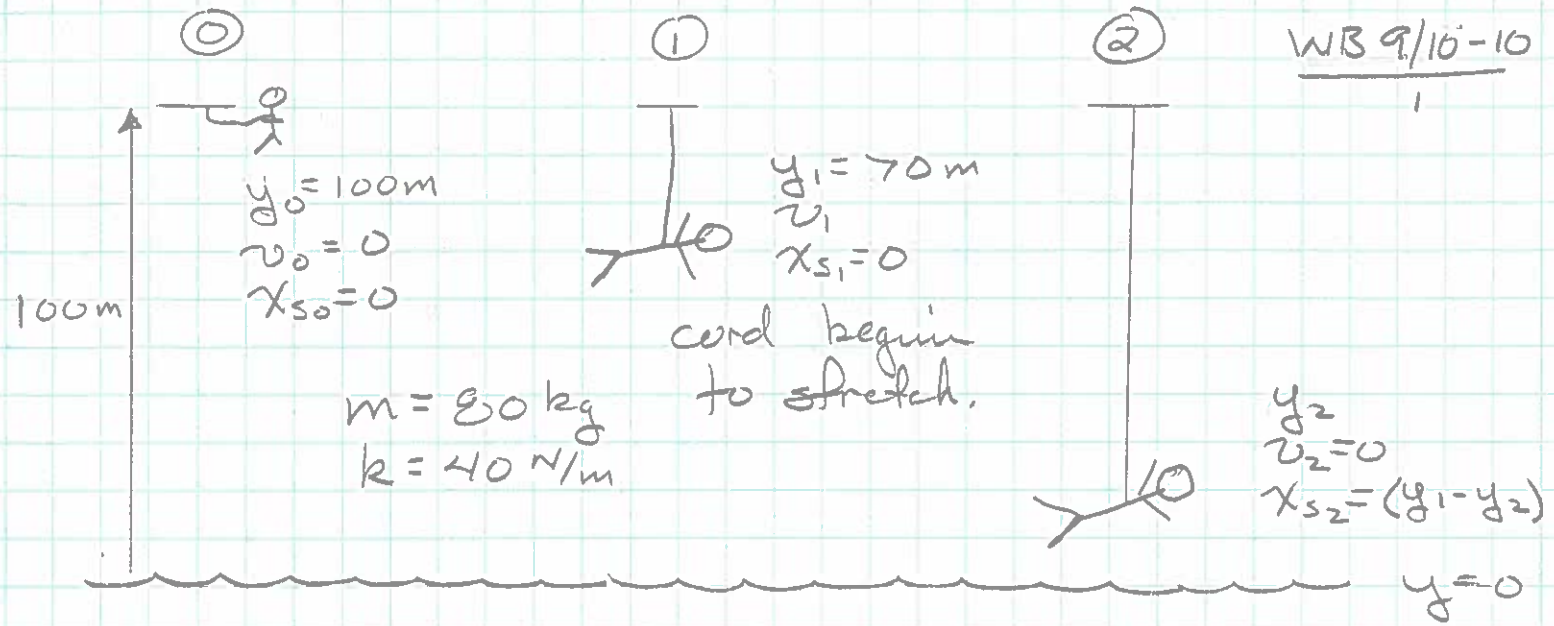

A bungee cord is more like a rubberband — it can be stretched, but not compressed. The cord begin to stretch at point 1.

Conserve energy $0 \to 2$:

$$\Delta E_{mech} = \Delta K + \Delta U_g + \Delta U_s = 0$$

$$\tfrac{1}{2} m (v_2^2 - v_0^2) + mg(y_2 - y_0) + \tfrac{1}{2} k (x_{s_2}^2 - x_{s_0}^2) = 0$$

$$mg(y_2 - y_0) + \tfrac{1}{2} k (y_1 - y_2)^2 = 0$$

$$mg(y_2 - y_0) + \tfrac{1}{2} k (y_1^2 - 2y_1 y_2 + y_2^2) = 0$$

or,

$$\tfrac{1}{2} k y_2^2 + (mg - k y_1) y_2 + (\tfrac{1}{2} k y_1^2 - mg y_0) = 0$$

put in numbers:

$$20 y_2^2 - 2016 y_2 + 19600 = 0$$

$$y_2 = \frac{2016 \pm \sqrt{(2016)^2 - 4(20)(19600)}}{2(20)}$$

$$= 50.4 \pm 39.5$$

$\therefore$ $y_2 = 89.9 m$ (unphysical) or $\underline{10.9 m}$