Question 1

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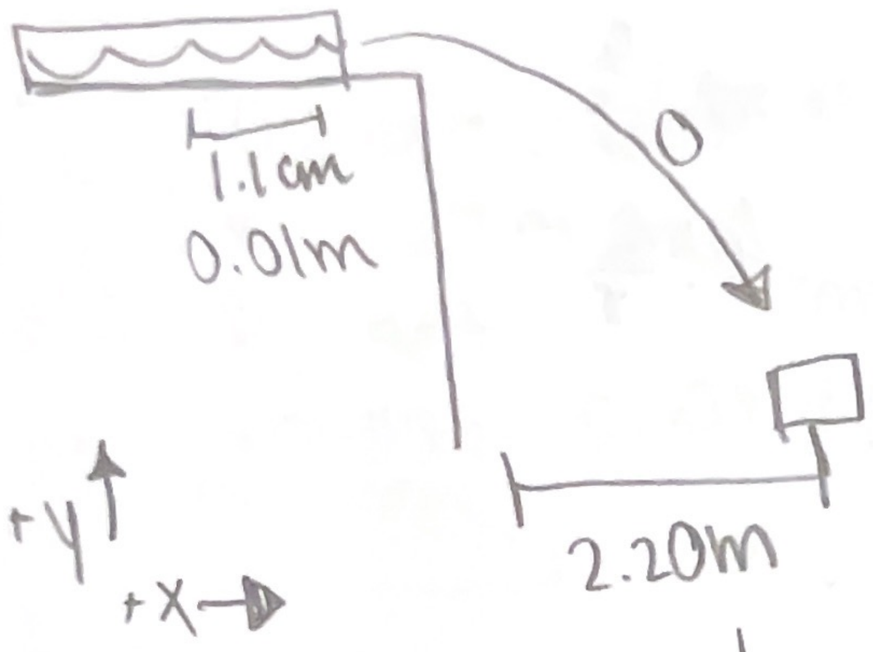

$\frac{1}{2}kx^2 = \frac{1}{2}mv^2$ $F = -kx$

$\Delta x = 0.27m + 0.01m$

$\Delta x = 0.28m$

$V = \frac{d}{t}$

$V = \frac{0.28}{t}$

$\Delta X = v_i t + \frac{1}{2}at^2$

$v_f = v_i + at$ $v_f^2 - v_i^2 = 2a \cdot \Delta X$

$v_f^2 = 2a\Delta X + v_i^2$

$v_f = \sqrt{2a\Delta X + v_i^2}$

$v_i + at = \sqrt{2a\Delta X + v_i^2}$

$a = -10m/s^2$

$\Delta X = 2.2m - 0.27 = 1.93m$

$v_i = ?$

$v_f = ?$

$mgh = \frac{1}{2}mv^2$

$gh = \frac{1}{2}v^2$

$\frac{2\Delta X}{v_i + v_f} = t$ $\frac{v_f - v_i}{a} = t$

$\frac{2\Delta X}{v_i + v_f} = \frac{v_f - v_i}{a}$

$(v_i + v_f)(v_f - v_i) = 2\Delta X a$

$v_f^2 - v_i^2 = 2\Delta X a$ $1.93 - 0.01m = 1.92m$

to get to hit the box, he must compress the spring by 2.3cm