Name: SOLUTIONS Student #: _____ /10

PHYS 1150: Quiz #7

/10 **Problem 1:** A 1.50 kg object is held 1.20 m above a relaxed massless, vertical spring with spring constant 320 N/m. The object is dropped onto the spring.

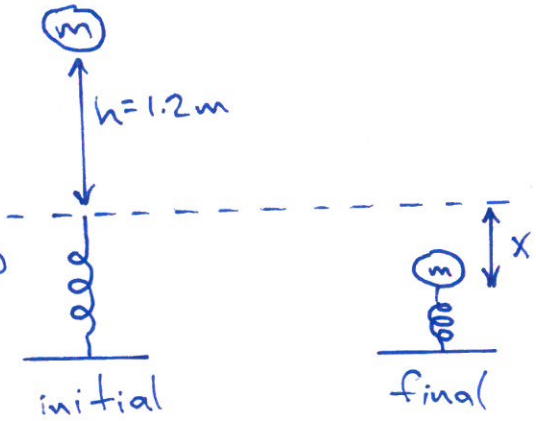
/5 (a) How far does the object compress the spring? (neglect friction)

$U_i = U_f$

$\Rightarrow mgh = -mgx + \frac{1}{2}kx^2$

$\Rightarrow \frac{1}{2}(320)x^2 - (1.5)(9.8)x - (1.5)(9.8)(1.2) = 0$

$\Rightarrow 160x^2 - 14.7x - 17.64 = 0$



$\Rightarrow x = -0.289\,m$ or $\boxed{x = 0.381\,m}$ (solve quadratic eq.)

↑ non-physical

/5 (b) Repeat part (a), but assume that a constant air-resistance force of 0.700 N acts on the object during its fall.

$U_i = U_f + \Delta Q$ where ΔQ = work done by friction

$= F \cdot \Delta x = (0.7)(1.2 + x)$

$\Rightarrow mgh = -mgx + \frac{1}{2}kx^2 + (0.7)(1.2+x)$

$\Rightarrow (1.5)(9.8)(1.2) = -(1.5)(9.8)x + \frac{1}{2}(320)x^2 + 0.84 + 0.7x$

$\Rightarrow 160x^2 - 14x - 16.8 = 0$

$\Rightarrow x = -0.283$ or $\boxed{x = 0.371\,m}$ (solve quadratic eq.)

↑ non-physical