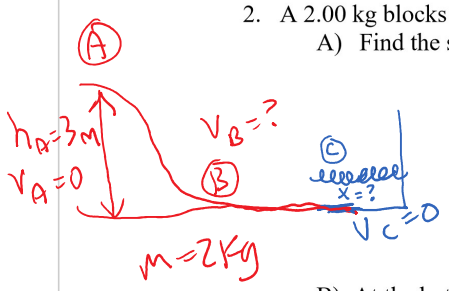
2. A 2.00 kg blocks rests on top of a frictionless slope that is 3.00 m high.
   A) Find the speed of the block at the bottom slope.



$KE_A^{\nearrow 0} + PE_A = KE_B + PE_B^{\nearrow 0}$

$mgh_A = \frac{1}{2}mv_B^2$

$(2.00Kg)(9.81m/s^2)(3.00m) = \frac{1}{2}(2.00Kg)v_B^2 \rightarrow \boxed{v_B = 7.67 m/s}$

   B) At the bottom of the slope the block continues to slide on a frictionless surface and collides with a spring that has a spring constant of 200. N/m. Find how much the spring compresses once the block is brought to a rest.

$K = 200N/m$

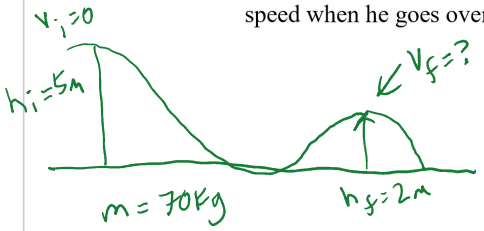
$x = ?$

$KE_A^{\nearrow 0} + PE_A = KE_C^{\nearrow 0} + PE_C$ (SPRING)

$mgh_A = \frac{1}{2}Kx^2$

$(2.00Kg)(9.81m/s^2)(3.00m) = \frac{1}{2}(200N/m)x^2 \rightarrow \boxed{x = 0.767m}$

3. A 70.0 kg skier slides down a hill that from a height of 5.00 m starting at rest. At the bottom he approaches another hill that is 2.00 m high. Assuming no friction, what is his speed when he goes over the second hill?



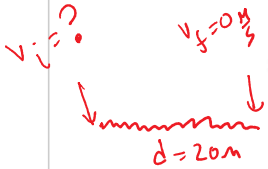
$KE_i^{\nearrow 0} + PE_i = KE_f + PE_f$

$mgh_i = \frac{1}{2}mv_f^2 + mgh_f$

$(70.0Kg)(9.81m/s^2)(5.00m) = \frac{1}{2}(70.0Kg)v_f^2 + (70.0Kg)(9.81m/s^2)(2.00m)$

$\boxed{v_f = 7.67 m/s}$

4. You are driving to school on Jefferson one sunny morning, when a boy on a bicycle rides into the road without looking. You slam on your brakes, leaving a 20 meter long skid mark on the road, but the boy on the bicycle is unharmed. At least he was safe until he heard the screeching, looked up and fell off his bicycle, bumping his head on the ground. When a policewoman arrives at the scene, she points to the skid mark and accuses you of speeding! The speed limit on that stretch of road is 45 mph (20 m/s). If your car has a mass of 1200 kg, and the road surface is dry asphalt, how fast were you going?



m = 1200Kg

$F_{fK} = \mu_K F_N$ ($F_N = F = mg$)

$F_{fK} = \mu_K(mg)$

$F_{fK} = (0.67)(1200Kg)(9.81m/s^2)$

$\boxed{F_{fK} = 7887.24N}$

$\mu_K = 0.67$

$KE_i + PE_i^{\nearrow 0} \pm W = KE_f^{\nearrow 0} + PE_f^{\nearrow 0}$ (-W since lost in ME)

$\frac{1}{2}mv_i^2 - F_{fK}d = 0$

$\frac{1}{2}(1200Kg)v_i^2 - (7887.24N)(20m) = 0$

$\boxed{v_i = 16.2 m/s}$

No, you were not speeding