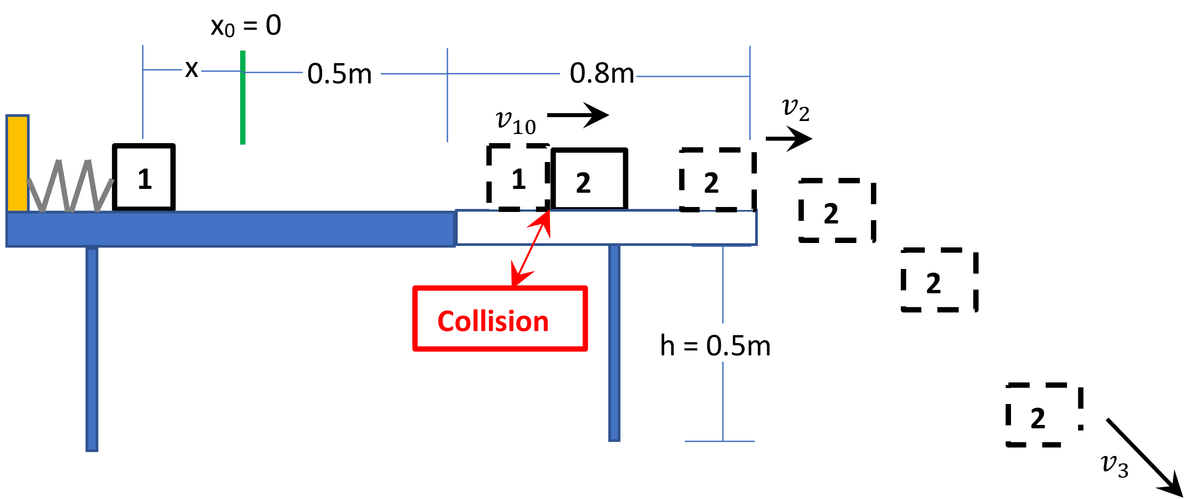
Challenge Question, PHYS 1211 F2018, November 16, 2018

In the Figure below, **box 1** (m_1 = 1.5 kg) is on a table. An unknown human **compresses** the box and spring ($k = 400\ N \cdot m^{-1}$) by x = 20 cm from **equilibrium** (indicated by the **green line** with x_0 = 0). The **blue portion** has **friction** ($\mu_k = 0.3666$ and $\mu_s = 0.55$), while the clear portion is **ice** (assumed **frictionless**). The dimension of the table is indicated in the diagram. The human then **released** Box 1 (i.e. the box and spring is now allowed to move). Box 1 then moves through the **blue section** to reach the **ice** section with a speed of v_{10}, then it **collides** (indicated by the **red sign**) with **Box 2** (mass m_2 = 3kg). **Box 1** rebounds from the collision with a velocity of $v_1 = 0.79133 m \cdot s^{-1}$, to the **left**, and **box 2** move to the right at a speed of v_2. Box 2 then falls off the table hitting the ground at a speed of v_3.



1. Find the **speed** of **box 1** when it reaches the **ice**, and just before the collision.
ANSWER: 2.374 m/s

2. Use **conservation** of **momentum** to find the **speed** of **Box 2**, v_2, **just after** the **collision**.
ANSWER: 1.5827 m/s

3. Use **conservation** of **mechanical energy** to find the **speed** of **Box 2**, v_3, just before it hits the ground.

4. Calculate the change in kinetic energy, $\Delta K = K_{final} - K_{initial}$, due to the **collision**. Based on your answer is the **collision elastic**.

5. If you did the all the calculation correctly you should find $\Delta K = 0$, so that the collision is **elastic**. Find **another way** (than done in the posted solution) to calculate the final speed of box 2, v_3. **HINT:** In the previous problem the **collision** was **not elastic**!

I will post the solution later!