PHY 9A Discussion 7, Spring 2018

1. Momentum Conservation

Bob pushes and sends a box of 5 [kg] mass on an icy, frictionless ground at a speed of 0.5 [m/s] to Alice who stands 3 [m] away from Bob, and Alice receives the box at some time later. Alice and Bob weigh 55 [kg] and 70 [kg], respectively.

i. What is Bob's speed after the release of the box?

ii. What is Alice's speed after the receiving of the box?

iii. Which of Alice and Bob moves by 2 [m] from their own original position first?

iv. Find the mass of the box that would result in the case where Alice and Bob simultaneously finish moving by 2 [m] from their original positions. What would be the speeds of Alice and Bob with the calculated mass of the box when they are in motion?

2. Ball and Spring

A ball of mass $m_1 = 200$ [g] is pushed against a massive spring of mass $m_2 = 500$ [g] and spring constant $k = 240$ [N/m], thereby compressing the spring by 15 [cm] from its original length.

i. What is the energy stored in the spring?

ii. Now the ball and the spring are released, and start to move on a frictionless ground. Write down the momentum conservation equation for the given situation.

iii. Find the speed of each object when they are moving on the ground after the release. Assume that the possible vibration of the released spring is negligible.

iv. Can the spring be massless in this problem? Explain.