1. Dumbbell *(6 points)*

Two perfectly elastic identic balls of mass m are connected by a spring of stiffness k so that a dumbbell-like system is formed. That dumbbell lays at rest on a slippery horizontal surface (all the friction forces can be neglected). Third ball (identic to the ones making up the dumbbell) approaches coaxially the dumbbell from the left side with velocity v (see Figure). Fourth ball (identic to the other ones) lays coaxially rightwards to the dumbbell.

1) Find the velocity of the centre of mass of the dumbbell after being hit by the ball approaching from the left.

2) For which distances L between the dumbbell and the rightmost ball, the final velocity of the latter will be exactly the same, as the initial velocity v of the leftmost ball?

