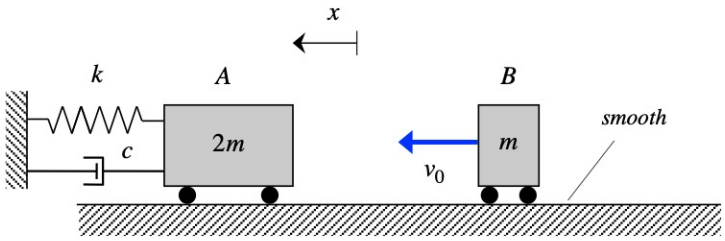
Homework H6.H

Given: Particle A (having a mass of $2m$) is attached to a grounded spring of stiffness k and a dashpot with a damping coefficient c. Let x represent the motion of A, with $x = 0$ when the spring is unstretched. At an instant when A is at rest and with the spring being unstretched/uncompressed (that is, when $x = 0$), particle B (of mass m), traveling with a speed of v_0, strikes A. On the impact with A, block B immediately sticks to block A.

Find: For this problem:
(a) Determine the speed of A immediately after B sticks to it.
(b) Derive the dynamical equation of motion (EOM) of A+B in terms of the coordinate x describing the motion after the two blocks stick together;
(c) Determine the undamped natural frequency ω_n, the damping ratio ζ and the damped natural frequency ω_d for the system;
(d) Determine the response $x(t)$ of the system after A and B stick together.



Use the following parameters in your analysis: $m = 10$ kg, $k = 3000$ N/m and $c = 360$ kg/s.