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% 9/8/19
% ECE 202 - Fall 2019 - MATLAB Exercise M1
% Equation source: http://www.convertalot.com/elastic collision calculator.html
% MATLAB script to determine the final velocities of 2 carts after an
% elastic collision.
clear % clears all variables in the workplace; avoids common errors
% ----- given information -----
m1 = 250; % mass of the cart#1 in g
m2 = 150; % mass of the cart#2 in g
v1i = 40; % initial velocity of cart#1 in cm/s
v2i = -30; % initial velocity of cart#2 in cm/s
% ----- calculations -----
% (a)
v1f = ((m1 - m2)*v1i + 2*m2*v2i)/(m1 + m2); % final velocity of cart#1 in cm/s
                                              % using momentum conservation
                                              % and kinetic energy
                                              % conservation
v2f = (2*m1*v1i - (m1 - m2)*v2i)/(m1 + m2); % final velocity of cart#2 in cm/s
                                              % using momentum conservation
                                              % and kinetic energy
                                              % conservation
% ----- check answers -----
check p = (m1*v1f + m2*v2f) - (m1*v1i + m2*v2i); % The change in the total
                                                  % momentum of the system
                                                  % before & after the
                                                  % collision should be
                                                  % zero.
check Energy = ((0.5*m1*(v1f)^(2)) + (0.5*m2*(v2f)^(2))) - ((0.5*m1*(v1i)^(2)) + (0.5 \checkmark (0.5*m1*(v1i)^(2)))
*m2*(v2i)^(2)));
                                                  % The change in the total
                                                  % energy of the system
                                                  % before & after the
                                                  % collision should be
                                                  % zero.
```