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1 % Sounak Ghosh
2 % 9/17/19
3 % ECE 202 - Fall 2019 - MATLAB Exercise M1
4 % Equation source: http://www.convertalot.com/elastic\_collision\_calculator.html
5 % MATLAB script to determine the final velocities of 2 carts after an
6 % elastic collision.
7
8
9 clear % clears all variables in the workplace; avoids common errors
10 clc % clears all previous outputs in the command window
11
12 % ----- given information -----
13
14 m1 = 250; % mass of the cart#1 in g
15 m2 = 150; % mass of the cart#2 in g
16 v1i = 40; % initial velocity of cart#1 in cm/s
17 v2i = -30; % initial velocity of cart#2 in cm/s
18
19
20 % ----- calculations -----
21 % (a)
22 M = m1 + m2; % total mass of cart#1 and cart#2 in g
23
24 v1f = (m1*v1i - m2*v1i + 2*m2*v2i)/ M % final velocity of cart#1 in cm/s
25 % using momentum conservation
26 % and kinetic energy
27 % conservation
28
29 v2f = (2*m1*v1i - m1*v2i + m2*v2i)/ M % final velocity of cart#2 in cm/s
30 % using momentum conservation
31 % and kinetic energy
32 % conservation
33
34 % ----- check answers -----
35 % (b)
36 p1i = m1*v1i; % Initial Momentum Cart#1
37 p2i = m2*v2i; % Initial Momentum Cart#2
38 p1f = m1*v1f; % Final Momentum Cart#1
39 p2f = m2*v2f; % Final Momentum Cart#2
40
41 checkMomentum = p1f + p2f - (p1i + p2i) % The change in the total
42 % momentum of the system
43 % before & after the
44 % collision should be
45 % zero.
46
47 e1i = 0.5*m1*v1i^2; % Initial Energy Cart#1
48 e2i = 0.5*m2*v2i^2; % Initial Energy Cart#2
49 e1f = 0.5*m1*v1f^2; % Final Energy Cart#1
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50 e2f = 0.5*m2*v2f^2;    % Final Energy Car1#2
51
52 checkEnergy = e1f + e2f - (e1i + e2i)
53                                     % The change in the total
54                                     % energy of the system
55                                     % before & after the
56                                     % collision should be
57                                     % zero.
58
```