

5. Two automobiles, each of mass M and moving with (small) speed V , collide at an intersection. Automobile A comes from the south and automobile B comes from the East. They stick together after the collision.

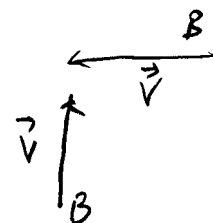
A. (3 pts) Is mechanical energy lost in the collision?

** (a). Yes

Completely inelastic!

(b). No

(c) Cannot tell.



B. (3 pts) Is momentum conserved in the collision?

** (a) Yes

Always, if the system is isolated.

(b) No

(c) Cannot tell

C. (4 pts) What is the speed of the stuck-together mass immediately after the collision?

(a) V .

(b) $\sqrt{2} V$.

** (c) $V/\sqrt{2}$.

(d) $V/2$.

C.m. vel. unchanged

$$\vec{V}_{cm} = \frac{M_A \vec{V}_A + M_B \vec{V}_B}{M_A + M_B}$$

$$= \frac{M_A(0, V, 0) + M_B(-V, 0, 0)}{M_A + M_B}$$

$$M_A = M_B \rightarrow = \frac{V}{2}(-1, 1, 0)$$

\vec{V}_{cm} after,

Magnitude = speed = $\sqrt{\frac{V^2}{4}(1+1)} = \sqrt{\frac{1}{2}V^2} = \frac{V}{\sqrt{2}}$