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?  Always, if the system is isolated.

**(a) Yes
(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) $V/2$.

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

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

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

$= \vec{V}_{cm}$ after, 

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