

① Principle of conservation of momentum:

In the absence of an external force in a certain dirⁿ, the total momentum of a system in that direction remains a constant.

$$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2, \text{ in that dir}^n.$$

② ~~FOR~~ NEWTON'S LAW OF RESTITUTION:

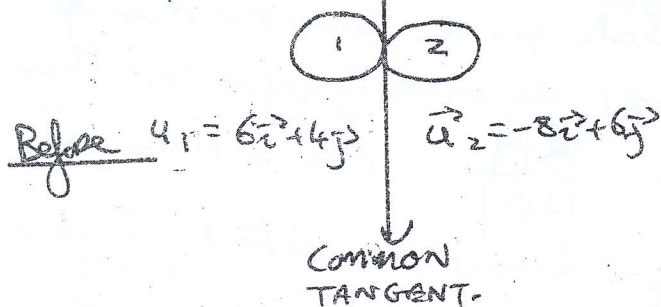
For bodies colliding directly, their relative velocity after the impact is equal to a constant, e , times their relative velocity before the impact and in the opposite dirⁿ. If they collide obliquely, this result holds for the components of the velocities along their line of centres. at impact. $v_2 - v_1 = -e(u_2 - u_1)$

③ Smoothness

If the two objects in collision are smooth then there is no change in the components of each's velocity in the direction of the COMMON TANGENT.

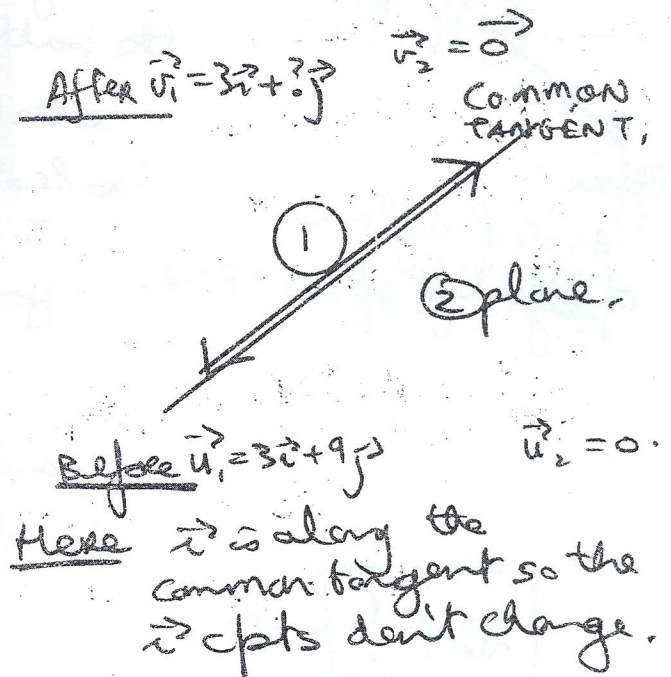
eg:

After $\vec{v}_1 = ?\vec{i} + 4\vec{j}$ $\vec{v}_2 = ?\vec{i} + 6\vec{j}$



Here $\vec{j}$ is along the common tangent so the $\vec{j}$ cpts don't change.

After $\vec{v}_1 = 3\vec{i} + ?\vec{j}$ $\vec{v}_2 = 0$
COMMON TANGENT.



Here $\vec{i}$ is along the common tangent so the $\vec{i}$ cpts don't change.

① and ② together make up the laws which govern oblique collisions.

③ is not a law as such.

The key in all collisions questions is to know the velocities both before and after the collision