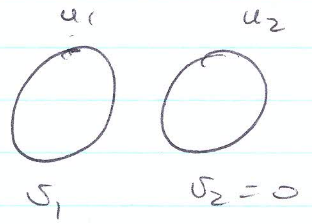
H, 80, 5

(a)



for any e

To show, that $\vec{u}_1$ and $\vec{u}_2$ are opposite dirⁿˢ

L.C.M $\Rightarrow$ $u_1 + u_2 = v_1$

N.L.R $\Rightarrow$ $v_2 - v_1 = -e(u_2 - u_1)$

$\Rightarrow -v_1 = -e(u_2 - u_1)$

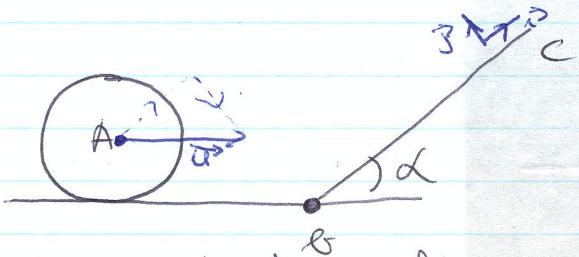
$\Rightarrow v_1 = e(u_2 - u_1)$

$\Rightarrow u_1 + u_2 = e(u_2 - u_1)$

$\Rightarrow u_2(1-e) = -(1+e)u_1$

since $0 < e < 1$ in order for the last statement to be correct u_2 and u_1 would have to be different in sign. ie. before collision the spheres would have to be going in opposite directions.

(b)



Let $\vec{i}$ be $\parallel$ to BC

$\vec{j}$ be $\perp$ to BC

Before impact relative to the plane the velocity of A is.

$\vec{u} = u\cos\alpha\,\vec{i} - u\sin\alpha\,\vec{j}$.

as we can ignore $\vec{i}$ cpts as they don't change as a result of the collision, we consider only components $\perp$ to the plane.

N.L.R $\Rightarrow$ $-e(-u\sin\alpha - 0) = v_A$

where v_A is velocity of sphere $\perp$ to plane after collision.

$\therefore \underline{v_A = eu\sin\alpha.}$ q.e.d.

$\therefore I$ = Change in momentum.

$= m(-u\sin\alpha - eu\sin\alpha)$

$\underline{I = -mu\sin\alpha(1+e)}$

$|\vec{I}| = mu\sin\alpha(1+e)$