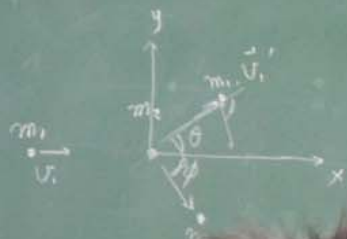


$$\begin{aligned}
 v_i^2 &= v_1'^2 \cos^2 \theta + v_2'^2 \sin^2 \theta + 2v_1'v_2' \cos \theta \sin \theta \\
 + 0 &= v_1'^2 \sin^2 \theta + v_2'^2 \cos^2 \theta - 2v_1'v_2' \sin \theta \cos \theta \\
 \hline
 v_i^2 &= v_1'^2 + v_2'^2 + 2v_1'v_2' [\cos \theta \sin \theta - \sin \theta \cos \theta]
 \end{aligned}$$

$$\cos(\theta + \phi) = 0$$



$$\begin{aligned}
 v_{1x}, v_{1y} \\
 v_{2x}, v_{2y}
 \end{aligned}$$

$$m_1 = m_2 = m$$

$$\frac{1}{2} m_1 v_i^2 = \frac{1}{2} m_1 v_1'^2 + \frac{1}{2} m_1 v_2'^2$$

$$x \rightarrow \bar{x} \quad m_1 v_i = m_1 v_1' \cos \theta + m_1 v_2' \sin \phi$$

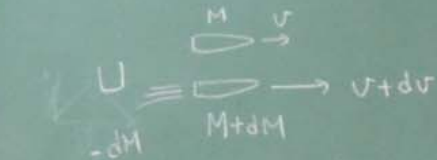
$$0 = m_1 v_1' \sin \theta - m_1 v_2' \cos \phi$$



$$\left(-\frac{dM}{dt}\right) v_{rel} = M \frac{dv}{dt}$$

$$-dM v_{rel} = M dv$$

$$\int_{v_1}^{v_2} dv = -v_{rel} \int_{M_1}^{M_2} \frac{dM}{M}$$



$$Mv = (-dM)U + (M+dM)(v+dv)$$

$$U + v_{rel} = v + dv$$

$$= (-dM)(v+dv - v_{rel}) + (M+dM)(v+dv)$$

$$-dM + (dM)v_{rel} + Mdv + dvM = 0$$

Recycle des petits déchets
 Une seule fois un seul usage
 Pour protéger l'environnement