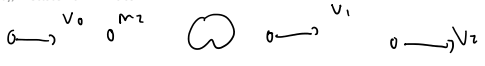
Pembahasan HW 1

Monday, 11 October 2021 10.08

1



Momentum kekal

$$m_1 v_0 = m_1 v_1 + m_2 v_2$$

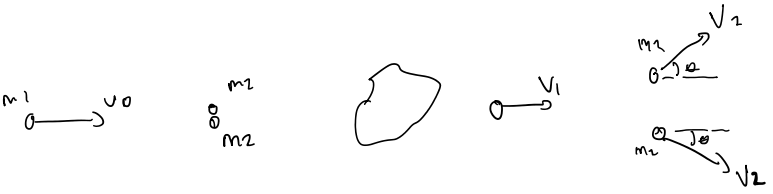
Ek. kekal

$$\frac{1}{2} m_1 v_0^2 = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2$$

2 unknown → 2 equation

$$v_1 = \frac{m_1 - m_2}{m_1 + m_2} v_0 \quad / \quad v_2 = \frac{2m_1}{m_1 + m_2} v_0$$

2



Momentum kekal

$$P_x \rightarrow m_1 v_0 = m_1 v_1 + 2 m_2 v_2 \cos\theta \quad \ldots\ldots (i)$$

$$P_y \rightarrow 0 = m_2 v_2 \sin\theta - m_2 v_2 \sin\theta$$

Ek kekal

$$\frac{1}{2} m_1 v_0^2 = \frac{1}{2} m_1 v_1^2 + 2 \frac{1}{2} m_2 v_2^2 \quad \ldots\ldots (ii)$$

$$v_1 = \frac{m_1 - 2m_2 \cos^2\theta}{m_1 + 2m_2 \cos^2\theta} \qquad v_2 = \frac{2m_1 \cos\theta}{m_1 + m_2 \cos^2\theta}$$

$v_0 = 0 \qquad \eta = 2\cos^{-1}\theta$

$\eta_{max} = 2$

$\eta = 3 \neq 2\cos^2\theta$

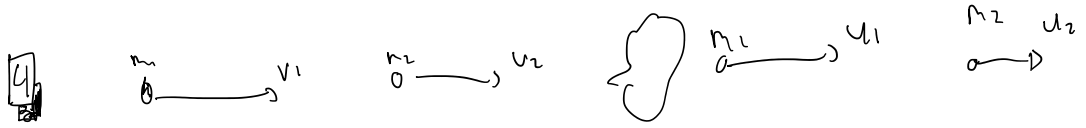
3

$$m_1 = 2m_2 \cos^2\theta$$

$$\eta = 2\cos^2\theta$$

$\eta(\theta) \rightarrow \eta_{max}(\theta = 0) = 1$

$\eta > 2$



$m_1 v_1 + m_2 v_2$

$$u_1 = \frac{m_2 v_1 + m_2 v_2 - m_2 e (v_1 - v_2)}{m_1 + m_2}$$

$$u_2 = \frac{m_1 v_1 + m_2 v_2 - m_1 e (v_2 - v_1)}{m_1 + m_2}$$

(c) $u_1 = v_{cm} - \alpha_1 (v_1 - v_2)$

$$\alpha_1 = \frac{m_2 e}{m_1 + m_2} \qquad \alpha_2 = \frac{m_1 e}{m_1 + m_2}$$

(d) $$\beta_1 = \frac{m_1 (1+e)}{m_1 + m_2} \qquad \beta = \frac{m_1 (1+e)}{m_1 + m_2}$$

(e) $$e k_0 = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2$$

$$E k = \frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2$$

$$\Delta E k = \frac{1}{2} \eta \frac{m_1 m_2}{m_1 + m_2} (v_1 - v_2)^2$$

$\eta = 1 - e^2$

f. $e = 1$ $\boxed{\Delta E_k = 0}$

$e = 0$ $\Delta E_k = \frac{1}{2} \underbrace{m_1 m_2}_{m_1 + m_2} (v_1 - v_2)^2$