1983 Laws – Notes

$\vec{v}_1 = a\vec{i} + 4\vec{j}$ (5) $\quad \vec{v}_2 = x\vec{i} - 3\vec{j}$ (10)

$u_1 = 5\vec{i} + 4\vec{j} \quad u_2 = -2\vec{i} - 3\vec{j}$.

[smoothness ⇒ $\vec{j}$ cpt unchanged]

PCM $[\vec{i}]$:

$5(5) + 10(-2) = 5(a) + 10x$ (1)

$5 = 5a + 10x$

$1 = a + 2x$

NLR $\vec{i}$:

$v_2 - v_1 = -e(u_2 - u_1)$

$x - a = -\frac{1}{7}(-2 - 5)$ (2)

$\Rightarrow x - a = 1.$

(1) + (2) $\Rightarrow 3x = 2 \Rightarrow x = \frac{2}{3}$

$\therefore$ (1) $\Rightarrow \frac{2}{3} - a = 1 \Rightarrow a = -\frac{1}{3}$

$\therefore$

$\vec{v}_1 = -\frac{1}{3}\vec{i} + 4\vec{j}$.

$\vec{v}_2 = \frac{2}{3}\vec{i} - 3\vec{j}$

Key Numbers. (Vectors)

ΔKE [$\vec{i}$ cpts only] [Total]

KE After $= \frac{1}{2}5\left(\frac{1}{3}\right)^2 + \frac{1}{2}10\left(\frac{2}{3}\right)^2 = \frac{45}{18}$

KE Before $= \frac{1}{2}5(5)^2 + \frac{1}{2}10(-2)^2 = \frac{165}{2}$

$\Delta KE = KE_{After} - KE_{before} = \frac{45}{18} - \frac{165}{2}$

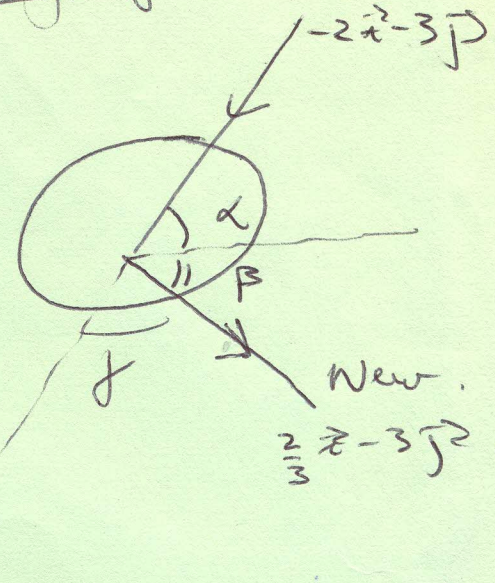
$= \frac{5}{2} - \frac{165}{2}$

$= \frac{-160}{2}$

$= -80$ Joules

qed.

Angle of deflection of B



Angle of deflection $= \gamma$

$= 180 - \alpha - \beta$

$\tan\alpha = \frac{3}{2} \Rightarrow \alpha = 56{\cdot}31$

$\tan\beta = \frac{3}{\frac{2}{3}} = \frac{9}{2} \Rightarrow \beta = 77{\cdot}47$

$\therefore \quad \gamma = 180 - 56{\cdot}31 - 77{\cdot}47$

$= 46{\cdot}22^\circ$

$\Rightarrow \tan\gamma = 1{\cdot}04.$