

μαθηματικά ασκήσιν 1

$$1) \quad \text{αν} \quad \left. \begin{aligned} u_1 &= u_1' + v, & U_1 &= U_1' - v \\ u_2 &= u_2' + v, & U_2 &= U_2' + v \end{aligned} \right\} \text{ υπολογίστε} \quad \begin{aligned} \frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2 &= \\ \frac{1}{2} m_1 U_1^2 + \frac{1}{2} m_2 U_2^2 & \end{aligned}$$

$$\frac{1}{2} m_1 (u_1' + v)^2 + \frac{1}{2} m_2 (u_2' + v)^2 = \frac{1}{2} m_1 (U_1' - v)^2 + \frac{1}{2} m_2 (U_2' + v)^2$$

$$\frac{1}{2} m_1 u_1'^2 + m_1 u_1' v + \cancel{\frac{1}{2} m_1 v^2} + \frac{1}{2} m_2 u_2'^2 + m_2 u_2' v + \cancel{\frac{1}{2} m_2 v^2} =$$

$$\frac{1}{2} m_1 U_1'^2 - m_1 U_1' v + \cancel{\frac{1}{2} m_1 v^2} + \frac{1}{2} m_2 U_2'^2 + m_2 U_2' v + \cancel{\frac{1}{2} m_2 v^2}$$

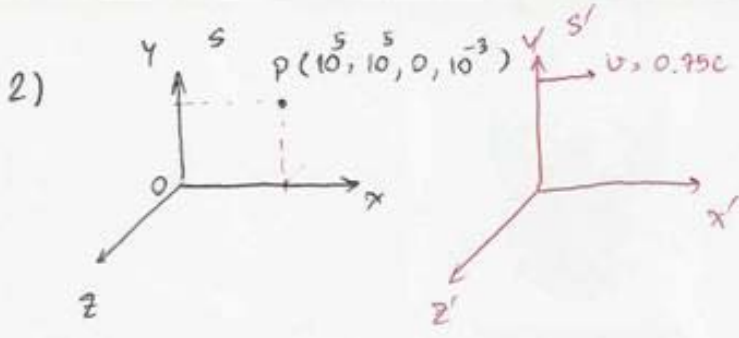
$$\frac{1}{2} m_1 u_1'^2 + \frac{1}{2} m_2 u_2'^2 + (m_1 u_1' + m_2 u_2') v = \frac{1}{2} m_1 U_1'^2 + \frac{1}{2} m_2 U_2'^2 - (m_1 U_1' - m_2 U_2') v \quad (*)$$

σημασιολογικά $m_1 u_1' + m_2 u_2' = -m_1 U_1' + m_2 U_2'$

υπολογισμός α.β.α

$$\frac{1}{2} m_1 u_1'^2 + \frac{1}{2} m_2 u_2'^2 + \cancel{(-m_1 U_1' + m_2 U_2') v} = \frac{1}{2} m_1 U_1'^2 + \frac{1}{2} m_2 U_2'^2 + \cancel{(-m_1 U_1' + m_2 U_2') v}$$

$$\therefore \frac{1}{2} m_1 u_1'^2 + \frac{1}{2} m_2 u_2'^2 = \frac{1}{2} m_1 U_1'^2 + \frac{1}{2} m_2 U_2'^2 \quad \times$$



$$x' = x - vt$$

$$= 10^5 - (0.75c \times 10^{-3})$$

$$= 10^5 - (0.75 \times 3 \times 10^8 \times 10^{-3})$$

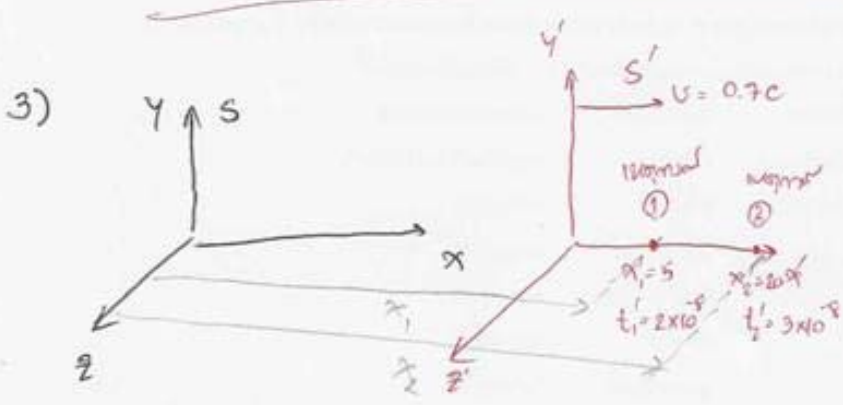
$$= -1.25 \times 10^5$$

$$y' = y = 10^5$$

$$z' = z = 0$$

$$t' = t = 10^{-3}$$

นั่น
 \therefore ๒p ในกรอบอ้างอิง S'
 คือ $(-1.25 \times 10^5, 10^5, 0, 10^{-3})$ ✗



$c = 3 \times 10^8 \text{ m/s}$

ใช้สมการของ Lorentz ๓ ที่แรก ; $x_1 = x'_1 + vt'_1$

$$= 5 + (0.7c)(2 \times 10^{-8})$$

$$= 9.2 \text{ m}$$

$$x_2 = x'_2 + vt'_2$$

$$= 20 + (0.7c)(3 \times 10^{-8})$$

$$= 26.3 \text{ m}$$

$$\therefore x_2 - x_1 = 26.3 - 9.2$$

$$= 17.1 \text{ m} \quad \text{✗}$$