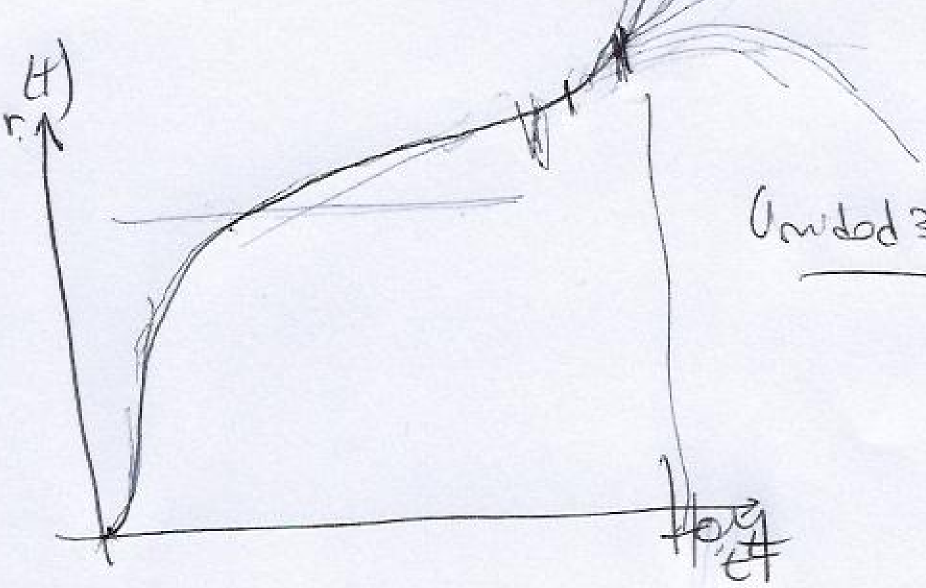
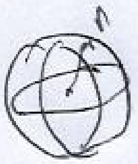
Corse chimp.



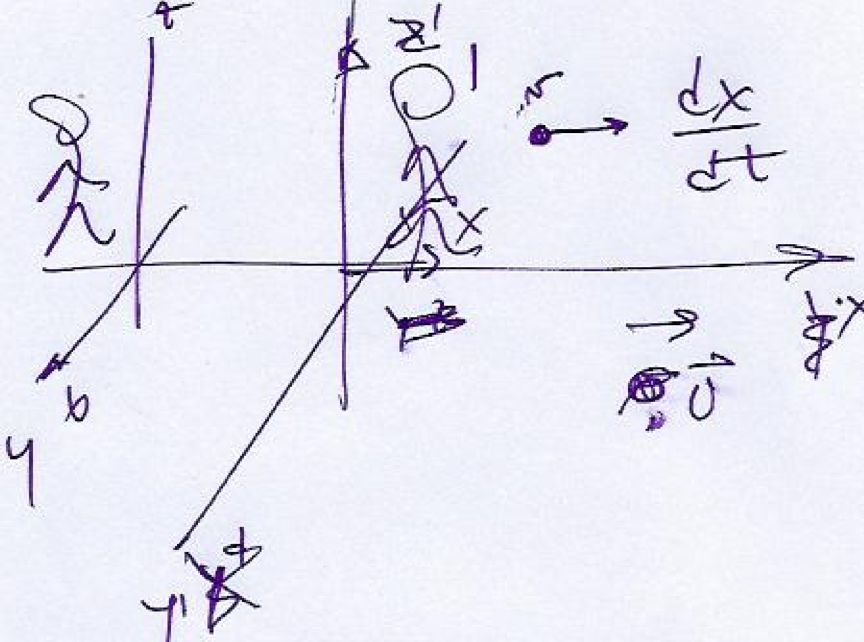
Unidad 3.



$$\vec{F} = \frac{d}{dt}\vec{p}$$

$m \cdot \vec{v}$

Andu.



$$\frac{dx}{dt}$$

$$\gamma = \frac{1}{\sqrt{1-\beta^2}}$$

$\beta = v/c$

$v \to 0 \quad \beta \to 0$

$v \to c \quad \beta \to 1.$

$\cancel{\beta > 1} \quad \cancel{v > c}$

$v \to 0 \to \beta \to 0 \to \gamma = 1$

$v \to c \to \beta \to 1 \to \gamma \to \infty$

Speed of light.

(1)

$$\left.\begin{aligned} \vec{U} &= \frac{d\vec{r}}{dt} \\ \vec{U}' &= \frac{dr'}{dt'} \end{aligned}\right\} \quad \begin{aligned} c &= \frac{dr}{dt} \\ c' &= \frac{dr'}{dt'} \end{aligned}$$

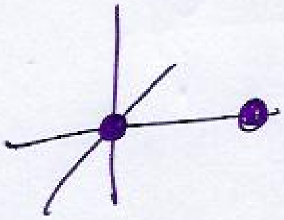
$c = c'$

$d = 2\,\mu s \cdot 3\times10^{8}\,\frac{m}{s} = 600\,m$

$c \simeq 1\ ft/ns$

$$ds^2 = c^2 dt^2 - dr^2 = c^2 dt'^2 - dr'^2 = c^2 d\tau^2$$

$\downarrow$ $dr_{propio} = 0$



$$c^2 dt'^2 - dx'^2 = c^2 d\tau^2$$

$\downarrow$

$$dt = \gamma\, d\tau$$

$$\vec{F} = \frac{d}{dt}(\vec{p})$$

$$\vec{F} = \frac{d}{dt}(m\gamma\vec{v})$$

$$\vec{F} = m\,\frac{d}{dt}(\gamma\vec{v})$$

a

$$= m\left(\frac{d\gamma}{dt}\vec{v} + \gamma\frac{dr}{dt}\right)$$

$$\boxed{\vec{p} = m\gamma\vec{v}.}$$

$$\vec{p} = \frac{d}{d\tau}(m\cdot\vec{r})$$

$m_0 \rightarrow m = m_0\gamma$

$$\vec{p} = (m\gamma)\,\vec{v}$$

$$p = m\,(\gamma\vec{v})$$

$\boxed{E = \gamma m c^2}$ → Energía total del sistema es una magnitud conservada.

$\gamma = \sqrt{\frac{1}{1-\beta^2}}$ $\quad c = 1 \Rightarrow E = \gamma m$

$\gamma^2 = 1/1-\beta^2$

$\beta \to 0 \quad v << c \quad \rightarrow \quad E = m\gamma c^2 \rightarrow E = \underbrace{mc^2} + \underbrace{\frac{1}{2} m v^2}_{\text{Energía cinética clásica.}}$

↓ $E = \gamma m c^2$ es la energía total

$E_0 = mc^2$ es la energía asociada a la masa.

$E_K = E - mc^2$

$= \gamma m c^2 - mc^2$

$\boxed{E_K = (\gamma - 1) m c^2}$

$E = 0{,}511\ MeV/c^2$

$E = 1{,}022\ MeV$

$E = E_m - E_K$

$\Rightarrow E_K = 1{,}022\ MeV - 0{,}511 \frac{MeV}{\cancel{c^2}} \cdot \cancel{c^2}$

$= 0{,}511\ MeV.$

$p = \underbrace{\gamma m v}$ $\quad E = \underbrace{\gamma m c^2} \Rightarrow E^2 = \gamma^2 m^2 c^4$

$p^2 c^2 = \gamma^2 m^2 v^2 c^2$

$p \cdot c = \gamma m v c$

$E^2 - p^2 c^2 = \gamma^2 m^2 c^4 - \gamma^2 m^2 v^2 c^2$

$= \gamma^2 m^2 c^4 (1 - \underbrace{v^2/c^2}_{\beta^2})$

$= \gamma^2 m^2 c^2 (1 - \beta^2) = 1/\gamma^2$

$= \cancel{\gamma^2} m^2 c^4 \frac{1}{\cancel{\gamma^2}}$

$m = 0{,}511 \, \frac{MeV}{c^2}$ y $m = 0{,}511\, MeV$.

$E^2 - p^2 = m^2$

$$\boxed{E^2 - p^2c^2 = m^2c^4}$$

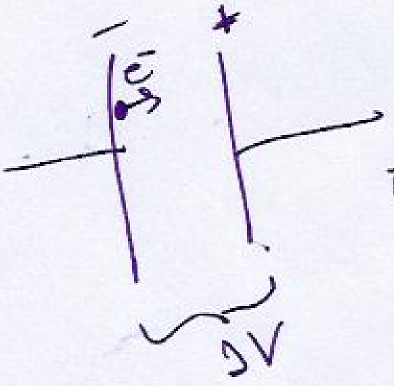
invariante relativista.

$$E^2 - p^2c^2 = E'^2 - p'^2c^2 = m^2c^4$$

$$E^2 - p^2c^2 = m^2c^4 \qquad m = 0.$$

$$E^2 = p^2c^2 \Rightarrow p^2 = E^2/c^2 \Rightarrow p = E/c$$

$$p = \frac{h\nu}{c}$$



$$E_q = \underset{1e}{q} \cdot \underset{1V}{V}$$

$$E = 1eV$$

$$E = 1{,}602\times10^{-19} J = 1eV$$

$E_K = E - m$

$p^2 = E^2 - m^2$

$$E^2 = p^2 + m^2$$

$$E = \sqrt{p^2 + m^2}$$

$$E = \sqrt{p^2\left(1 + m^2/p^2\right)}$$

$$E = p\sqrt{1 + m^2/p^2}$$