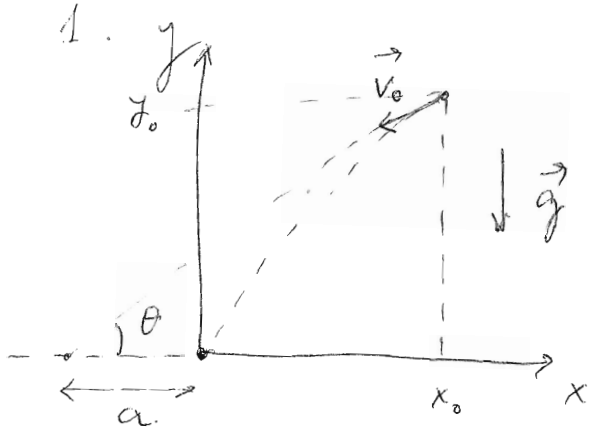
EXAMEN FINAL MASTER IGJRV 2006-

1.



PTO. IMPACTO (0,0)

BOYA $\begin{cases} \vec{r}_0 = x_0 \vec{i} + y_0 \vec{j} \\ \vec{v}_0 = -v_0 \cos\theta \vec{i} - v_0 \sin\theta \vec{j} \\ \vec{a} = -g \vec{j} \end{cases}$

$\Rightarrow \begin{cases} \vec{a} = \dfrac{d\vec{v}}{dt} \\ \vec{v} = \dfrac{d\vec{r}}{dt} \end{cases} \Rightarrow \begin{cases} \vec{r}(t) = \vec{r}_0 + \vec{v}_0 t + \frac{1}{2}\vec{a} t^2 \\ \vec{v}(t) = \vec{v}_0 + \vec{a} \cdot t \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x(t) = x_0 - v_0 \cos\theta \, t & v_x = -v_0 \cos\theta \, t \\ y(t) = y_0 - v_0 \sin\theta \, t - \frac{1}{2} g t^2 & v_y = -v_0 \sin\theta \, t - \frac{1}{2} g t^2 \end{cases}$

En el instante del impacto $t = t_{imp}$

$x(t_{imp}) = y(t_{imp}) = 0 \Rightarrow$

$\Rightarrow$ (1) $0 = x_0 - v_0 \cos\theta \, t_{imp}$

(2) $0 = y_0 - v_0 \sin\theta \, t_{imp} - \frac{1}{2} g t_{imp}^2$ $\Big\}$ 2 ec. 3 incog. x_0, y_0, t_{imp}

$\Rightarrow$ (3) $\tan\theta = \dfrac{y_0}{x_0 + a}$ 3ª ec. $\Rightarrow y_0 = (x_0 + a) \cdot \tan\theta$

De (1) $t_{imp} = \dfrac{x_0}{v_0 \cos\theta}$

Sustituyendo t_{imp} e y_0 en (2) $\Rightarrow$

$$(x_0 + a)\tan\theta = v_0 \sin\theta \cdot \frac{x_0}{v_0 \cos\theta} + \frac{1}{2} g \frac{x_0^2}{v_0^2 \cos^2\theta} \Rightarrow$$

$$\Rightarrow \quad x_0 + a = x_0 + \frac{1}{2} g \frac{x_0^2}{v_0^2} \cdot \frac{1}{\frac{\sin\theta}{\cos\theta} \cos^2\theta} \Rightarrow$$

$$\Leftarrow \quad a = \frac{g x_0^2}{v_0^2} \frac{1}{\sin 2\theta} \Rightarrow x_0 = + \sqrt{\frac{a v_0^2 \sin 2\theta}{g}}$$

$$\Rightarrow \quad y_0 = \left(\sqrt{\frac{a v_0^2 \sin 2\theta}{g}} + a \right) \cdot \tan\theta = 450'7 \text{ m}$$