d après la 2 loi de Newton :

$\sum \vec{F_{ext}} = \frac{d\vec{p}}{dt}$

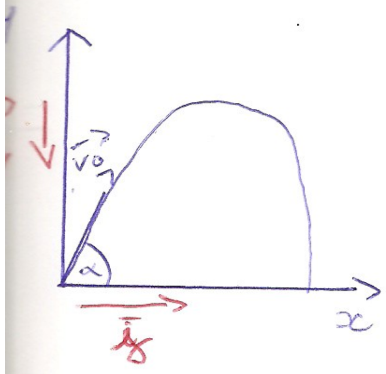
la masse de la balle ne variant pas au cours du temps

on a : $\frac{d\vec{p}}{dt} = \frac{d(m.\vec{v})}{dt} = m.\frac{\vec{v}d}{dt} = m.\vec{a}$

$\sum \vec{F_{ext}} = \vec{P} = m.\vec{g}$

donc $m.\vec{g} = m.\vec{a}$ soit $\vec{g} = \vec{a}$

$\vec{v} \int_0^t \vec{a}\,dt$ et $OM \int_0^t \vec{v}\,dt$



on a $\vec{a} = \vec{g} = g.\vec{i}$

donc $d\vec{v} = \vec{a}\,dt$

$$\int_{V(T=0)}^{V(T)} d\vec{v} = \int_{V(T=0)}^{V(T)} \vec{a}\,dt$$

$d\vec{v} = dv_x\vec{j} + dv_y\vec{i}$

$\vec{a} = a_x.\vec{j} + a_y.\vec{i}$

ici $a_x = 0$ et $a_y = g$

$$\int_{V(T=0)}^{V(T)} (dv_x\vec{j} + dv_y.\vec{i}) = \int_{V(T=0)}^{V(T)} (a_x.\vec{j} + a_y.\vec{i})\,dt$$

$$\int_{V(T=0)}^{V(T)} dv_x\vec{j} + \int_{V(T=0)}^{V(T)} dv_y.\vec{i} = \int_{V(T=0)}^{V(T)} 0\vec{j} + \int_{V(T=0)}^{V(T)} g\vec{i}$$

$$\int_{V(T=0)}^{V(T)} dv_x.\vec{j} + \vec{i}\int_{V(T=0)}^{V(T)} dv_y.\vec{i} = \vec{j}\int_{V(T0)} 0\,dt + \vec{i}\int_{V(T=0)}^{V(T)} \vec{g}\,dt$$

$v_y] = g[t]_0^t + V_0.\sin\alpha$

$v_x] = V_0.\cos\alpha$

$OM_y = \frac{1}{2}gt^2 + V_0.\sin\alpha.t$

$OM_x = V_0.\cos\alpha.T$