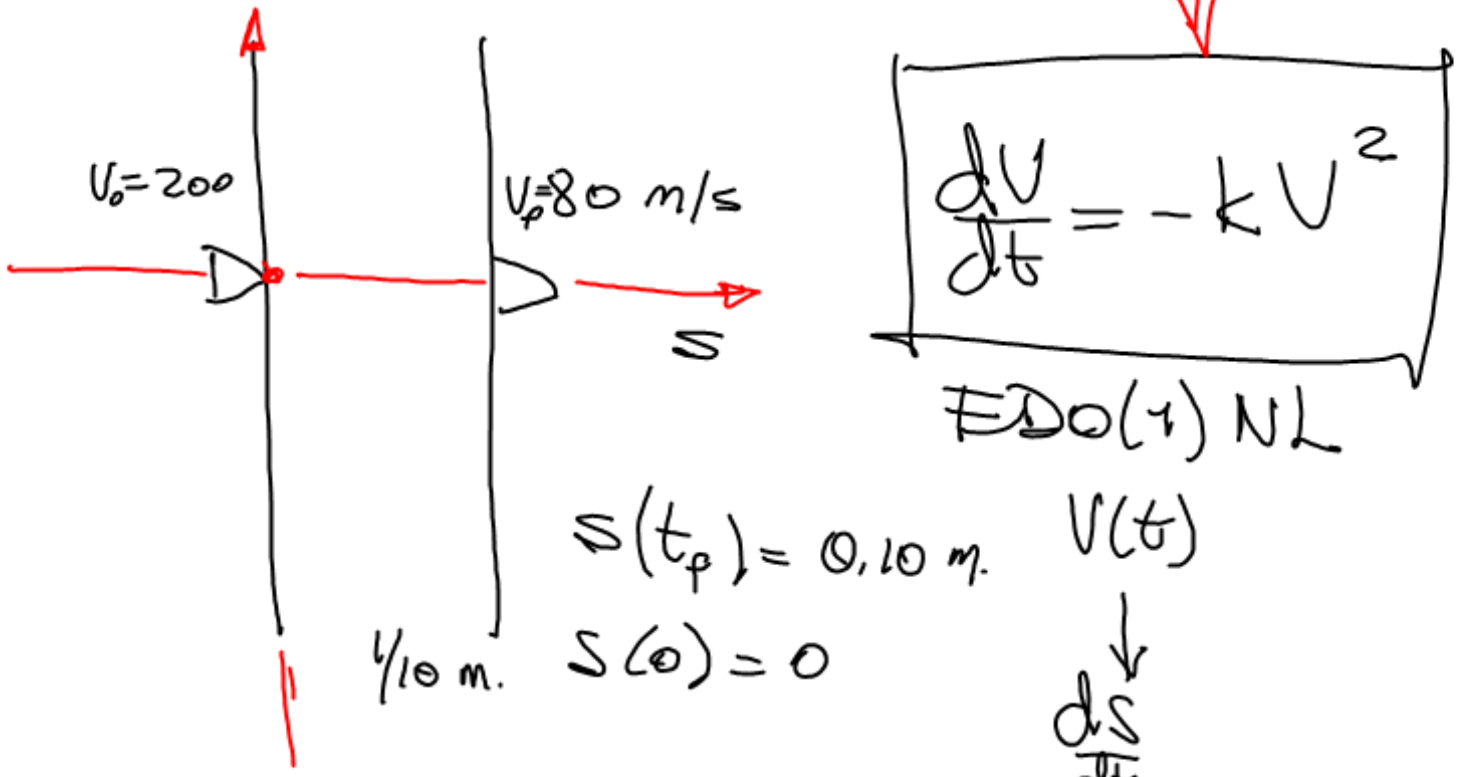
es una circunferencia.

114. Una bala se introduce en una tabla de $h = 10$ cm de espesor con la velocidad $v_0 = 200$ m/s traspasándola con la velocidad $v_1 = 80$ m/s. Suponiendo que la resistencia de la tabla al movimiento de la bala es proporcional al cuadrado de la velocidad, hallar el tiempo del movimiento de la bala por la tabla.



$$\frac{dV}{dt} = -kV^2$$

$$kV^2 + \frac{dV}{dt} = 0 \qquad \text{Variables separables}$$

$p(t) = k \quad q(V) = V^2 \quad r(t) = 1 \quad s(t) = 1$

$$k\,dt + \frac{dV}{V^2} = 0$$

$$k\int dt + \int \frac{dV}{V^2} = C_1$$

$$kt - \frac{1}{V} = C_1$$

$$-\frac{1}{V} = C_1 - kt$$

$$\frac{1}{V} = kt - C_1$$

$$V(t) = \frac{1}{kt - C_1} \quad (SG_1)$$

$V(0) = 200 \ \frac{m}{s}$

$$V(0) \Rightarrow 200 = \frac{1}{k(0) - C_1}$$

$$200 = -\frac{1}{C_1}$$

$$C_1 = -\frac{1}{200}$$

$$V(t) = \frac{1}{kt + \frac{1}{200}}$$

$$\frac{ds(t)}{dt} = \frac{1}{kt + \frac{1}{200}} \qquad EDO(1)\ NL$$

$$ds = \frac{dt}{kt + \frac{1}{200}} \qquad \text{Variables Separables}$$

$$\int ds = \frac{1}{k}\int \frac{k\,dt}{kt + \frac{1}{200}} + C_2 \qquad u = kt + \frac{1}{200} \quad du = k\,dt$$

$$s(t) = \frac{1}{k} L\left(kt + \frac{1}{200}\right) + C_2 \qquad s(0) = 0$$

$$s(t) = \frac{L\left(kt + \frac{1}{200}\right)}{k} - \frac{L\left(\frac{1}{200}\right)}{k} \qquad 0 = \frac{1}{k}\left(L\,\frac{1}{200}\right) + C_2$$

$$0 = L\left(\frac{1}{200}\right) + kC_2$$

$$C_2 = -\frac{L\left(\frac{1}{200}\right)}{k}$$

$$ks = L\left(\frac{kt + \frac{1}{200}}{\frac{1}{200}}\right)$$

$$\frac{kt + \frac{1}{200}}{\frac{1}{200}} = e^{ks}$$

$$kt + \frac{1}{200} = \frac{e^{ks}}{200}$$

$$200\,kt = e^{ks} - 1$$

$$t_f = \frac{e^{\frac{k}{70}} - 1}{200k}$$

$$V(t) = \frac{1}{kt + \frac{1}{200}}$$

$$V(t) = \frac{1}{k\left(\frac{e^{k/10} - 1}{200k}\right) + \frac{1}{200}} = 80$$

$$\frac{1}{\frac{e^{k/10}}{200} - \frac{1}{200} + \frac{1}{200}} = 80$$

$$\frac{1}{80} = \frac{e^{k/10}}{200}$$

$$\frac{200}{80} = e^{k/10}$$

$$\ln\left(\frac{200}{80}\right) = \frac{k}{10}$$

$$k = \ln\left(\frac{200}{80}\right)^{10}$$

$$V(t) = \frac{1}{kt + \frac{1}{200}}$$ SG

SP

$$V(t) = \frac{1}{\left(\alpha\left(\frac{200}{80}\right)^{10} t + \frac{1}{200}\right.}$$

$$s(t) = \frac{\alpha\left(\frac{kt}{200} + \frac{1}{200}\right)}{\alpha\left(\frac{200}{80}\right)^{10}}$$

SP

$$s(t) = \frac{\alpha\left(\frac{\alpha\left(\frac{k}{200}\right)^{10} t}{200} + \frac{1}{200}\right)}{\alpha\left(\frac{200}{80}\right)^{10}}$$