A thick black L-shaped frame surrounds the text. The top horizontal bar is on the left, the left vertical bar is on the left, and the bottom horizontal bar is on the right, with a vertical bar on the right side.

# ESTUDO DA RESISTÊNCIA DO AR

Alunos: Afonso Mendes / Catarina Vieira / Francisco Esteves / Lucas Silva

# Método de Euler – desprezando atrito

$$\vec{F} = m\vec{a}$$



2ª Lei de Newton

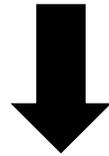
$$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$$

$$a = \frac{dv}{dt}$$

$$a = \frac{F}{m}$$

# Método de Euler – desprezando atrito

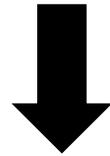
$$\frac{dv}{dt} = \frac{v(t + \Delta t) - v(t)}{\Delta t}$$



$$v(t + \Delta t) = \frac{F}{m} \Delta t + v(t)$$

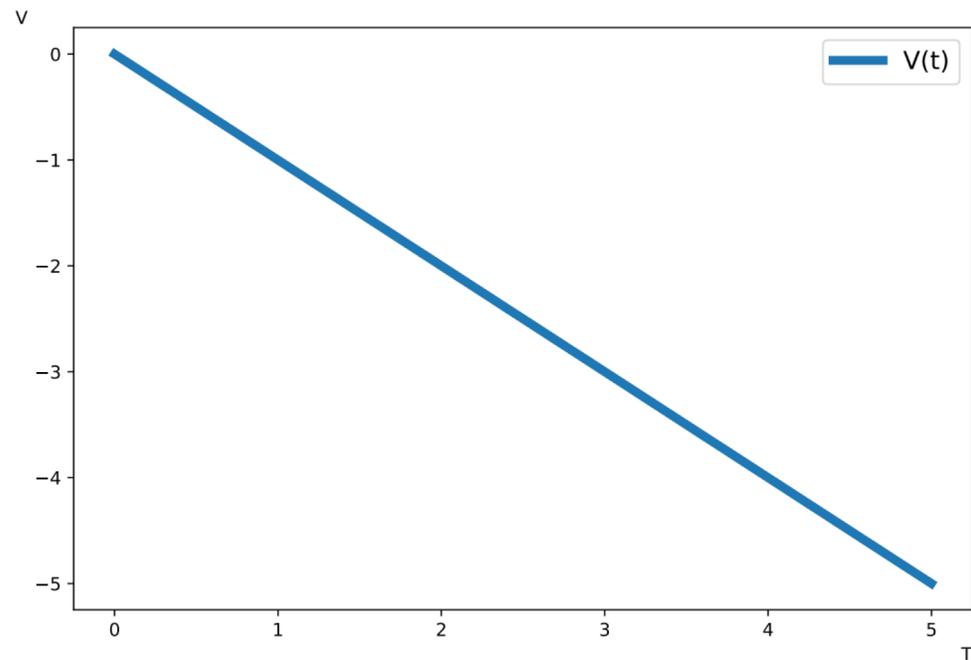
# Método de Euler – desprezando atrito

$$\frac{dx}{dt} = \frac{x(t + \Delta t) - x(t)}{\Delta t}$$

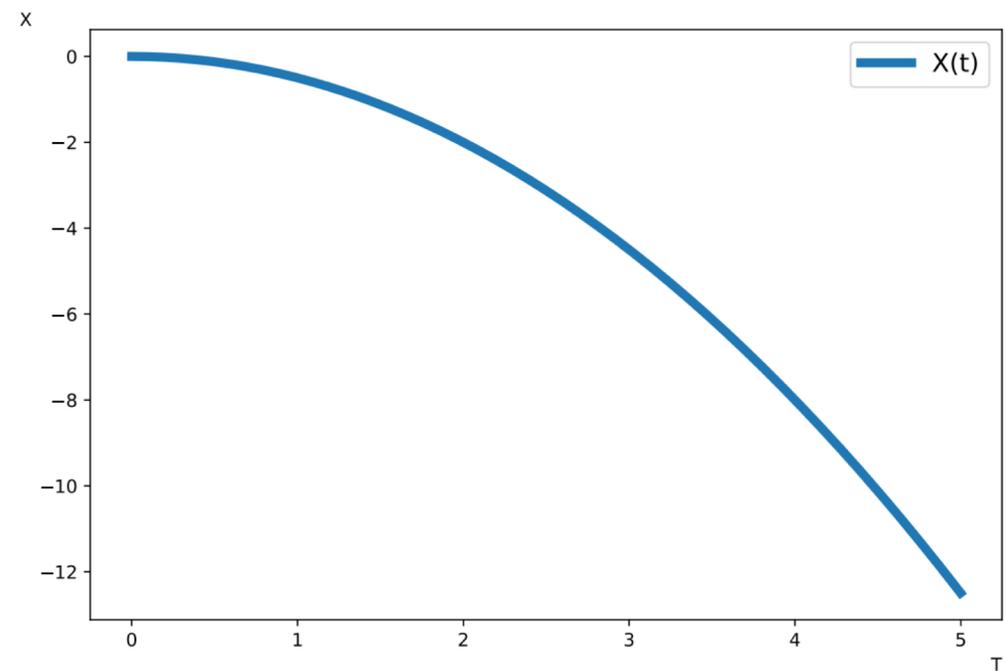


$$x(t + \Delta t) = v(t)\Delta t + x(t)$$

## Gráfico velocidade-tempo



## Gráfico posição-tempo



# Método de Euler – atrito apreciável

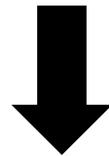
$$F = -mg - \gamma v$$

↓  $u = \frac{\gamma}{m}$

$$\frac{dv}{dt} = -g - uv$$

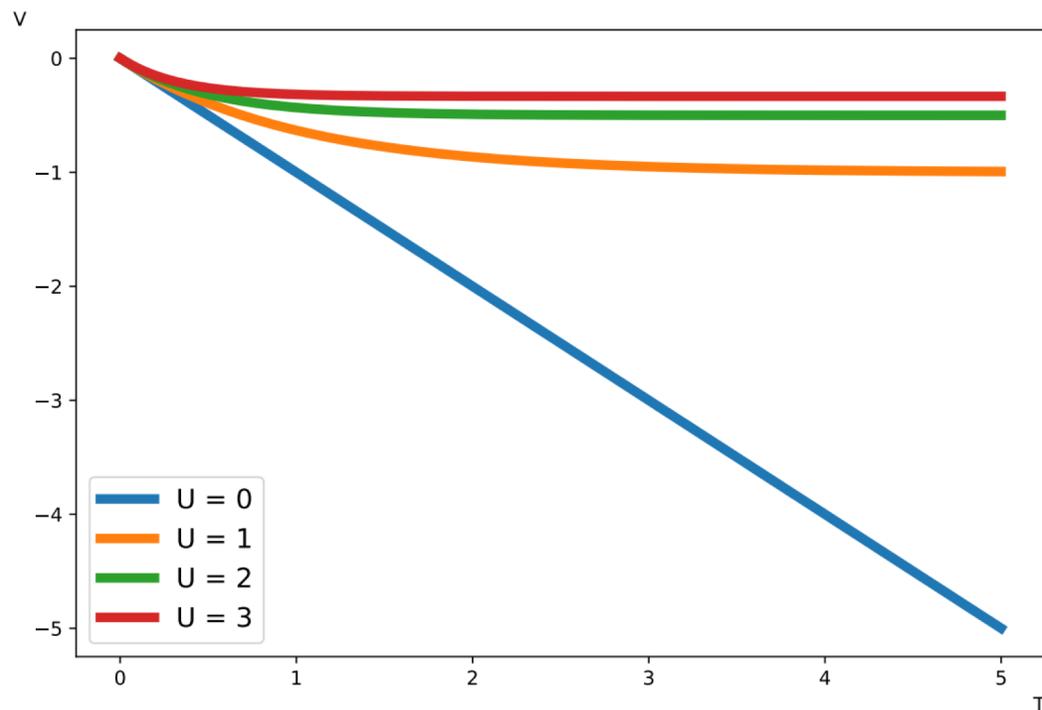
# Método de Euler – atrito apreciável

$$\frac{dv}{dt} = -g - uv$$

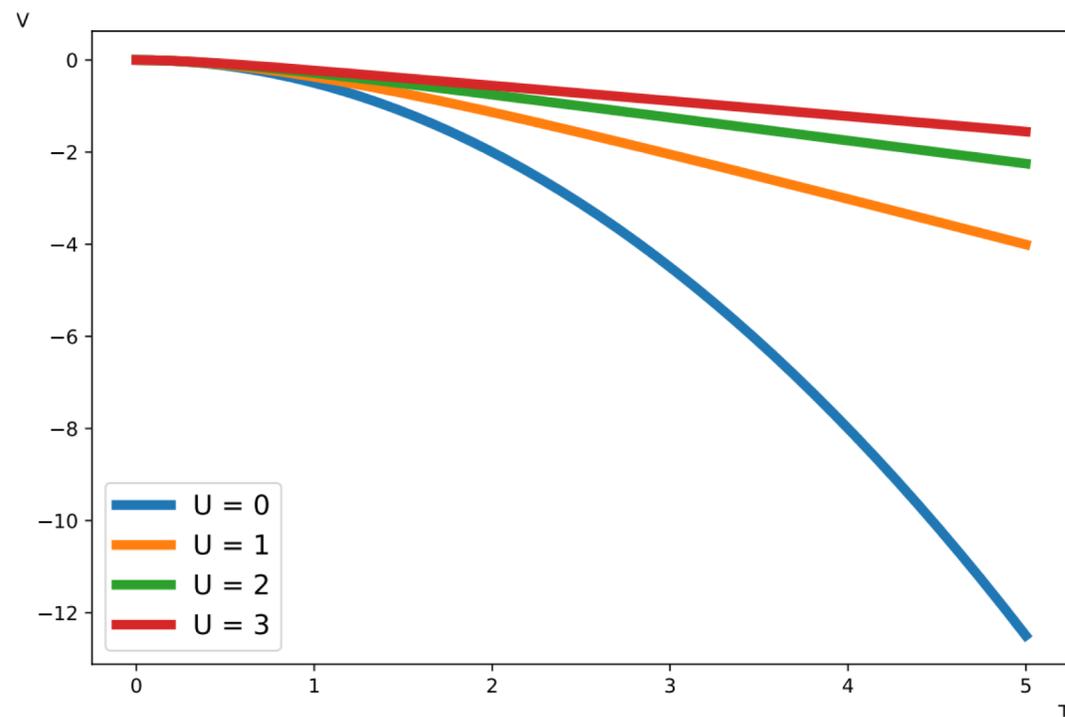


$$v(t + \Delta t) = [-g - uv(t)] \Delta t + v(t)$$

# Gráfico velocidade-tempo



# Gráfico posição-tempo



# Conservação do momento e da energia

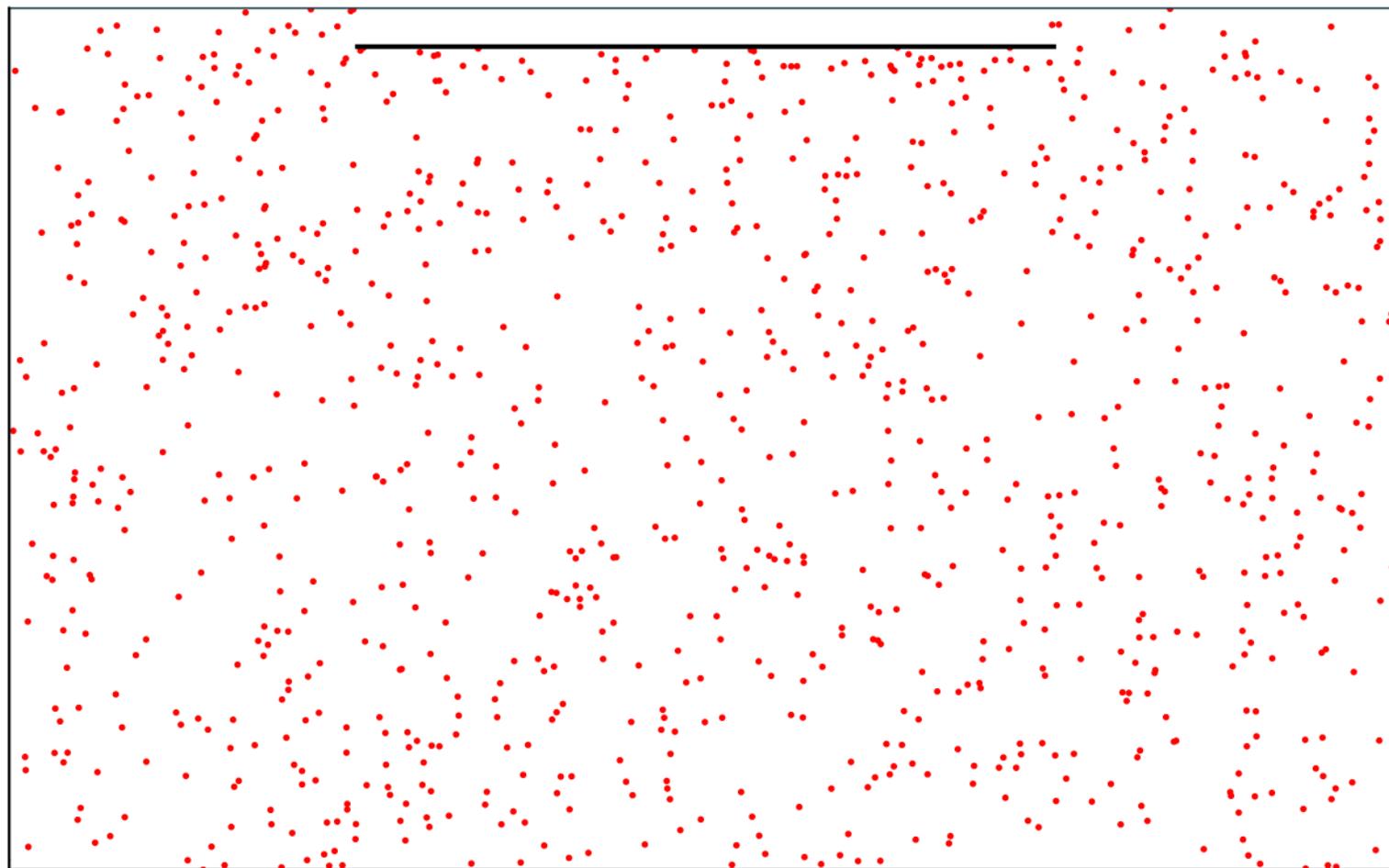
$$\vec{P} = m\vec{v}$$

$$E_c = \frac{1}{2}mv^2$$

# Conservação do momento e da energia

$$\left\{ \begin{array}{l} mv_{i1} + mv_{i2} = mv_{f1} + mv_{f2} \\ \frac{1}{2}m(v_{i1})^2 + \frac{1}{2}m(v_{i2})^2 = \frac{1}{2}m(v_{f1})^2 + \frac{1}{2}m(v_{f2})^2 \end{array} \right.$$

# Simulação



# Resultado da simulação

