

# Modelo Presa-Depredador

## Lotka-Volterra

$$\frac{dx}{dt} = x(-a + by) \quad x \Rightarrow \text{coyotes}$$

$$\frac{dy}{dt} = y(d - cx) \quad y \Rightarrow \text{conejos}$$

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$$\frac{dx}{dt} = -0.16x + 0.08xy \quad x(0) = 4$$

$$\frac{dy}{dt} = 4.5y - 0.9xy \quad y(0) = 4$$

$$\frac{dx}{dt} = a_{11}x + a_{12}y + b_1(t)$$

$$\frac{dy}{dt} = a_{21}x + a_{22}y + b_2(t)$$

SISTEMA. EDO(1) LINEAL, CC. NH.

$$\frac{d}{dt} \bar{x} = A \bar{x} + \bar{b}(t)$$

$$\frac{d^3 y}{dt^3} - 3 \frac{d^2 y}{dt^2} + 4 \frac{dy}{dt} - 2y = 4e^{2t} \quad \begin{cases} y(0) = 2 \\ y'(0) = -3 \\ y''(0) = 5 \end{cases}$$


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$$y(t) = y_1(t) \quad y(0) \Rightarrow y_1(0) = 2$$

$$\frac{dy}{dt} = \frac{dy_1}{dt} = y_2 \quad y'(0) \Rightarrow y_2(0) = -3$$

$$\frac{d^2 y}{dt^2} = \frac{dy_2}{dt} = y_3 \quad y''(0) \Rightarrow y_3(0) = 5$$

$$\frac{d^3 y}{dt^3} = \frac{dy_3}{dt} \Rightarrow \frac{dy_3}{dt} = 2y_1 - 4y_2 + 3y_3 + 4e^{2t}$$

$$\frac{d}{dt} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 2 & -4 & 3 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 4e^{2t} \end{bmatrix}$$