

TEMA 3.-

Ecuaciones Integrales Diferenciales

$$\frac{dx}{dt} = 1 - t - \int_0^t x(\tau) d\tau.$$

$$x(0) = 0$$

$$\frac{dy}{dt} = \cos(t) + \int_0^t y(z) \cos(t-z) dz.$$
$$y(0) = 1$$

$$\begin{aligned} x'' + y'' &= e^{2t} & x(0) = y(0) &= 0 \\ 2x' + y'' &= -e^{2t} & x'(0) = y'(0) &= 0 \end{aligned}$$

$$\begin{aligned} x(t) &= x_1(t) & x_1(0) &= 0 \\ x'(t) &= \frac{dx_1(t)}{dt} = x_2(t) & x_2(0) &= 0 \\ y(t) &= y_1(t) & y_1(0) &= 0 \\ y'(t) &= \frac{dy_1(t)}{dt} = y_2(t) & y_2(0) &= 0 \end{aligned}$$

$$\begin{aligned} x'' + y'' &= e^{2t} \\ -2x' - y'' &= e^{2t} \end{aligned}$$

$$x'' - 2x' = 2e^{2t}$$

$$x'' = 2x' + 2e^{2t}$$

$$y'' = -2x' - e^{2t}$$

$$\frac{dx_1(t)}{dt} = x_2(t) \quad x_1(0) = 0$$

$$\frac{dx_2(t)}{dt} = 2x_2(t) + 2e^{2t} \quad x_2(0) = 0$$

$$\frac{dy_1(t)}{dt} = y_2(t) \quad y_1(0) = 0$$

$$\frac{dy_2(t)}{dt} = -2x_2(t) - e^{2t} \quad y_2(0) = 0$$

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$$\frac{d}{dt} \begin{bmatrix} x_1 \\ x_2 \\ y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & -2 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ y_1 \\ y_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 2e^{2t} \\ 0 \\ -e^{2t} \end{bmatrix}$$

$$\frac{d}{dt} \bar{x} = A \bar{x} + b(t) \quad \bar{x}_0$$

$$\bar{x} = e^{At} \bar{x}_0 + \underbrace{\int_0^t e^{A(t-\tau)} b(\tau) d\tau}_{\text{Prod Tan}}$$

