

$$\frac{dx}{dt} = y$$

$$\frac{dy}{dt} = -2x + 3y$$

① Metode Substitusi Langsung

$$\frac{dx}{dt} = y \dots (1)$$

$$\frac{dy}{dt} = -2x + 3y \dots (2)$$

(1) turunkan:

$$\frac{d^2x}{dt^2} = \frac{dy}{dt} \dots (3)$$

(1) & (3) → (2)

$$\frac{d^2x}{dt^2} = -2x + 3\left(\frac{dx}{dt}\right)$$

$$\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 0$$

PD linier orde 2 homogen. koef. konstanta

$$D^2x - 3Dx + 2x = 0$$

$$(D^2 - 3D + 2)x = 0$$

Mis: $D = m$

$$m^2 - 3m + 2 = 0$$

$$(m-1)(m-2) = 0$$

$$x = c_1 e^t + c_2 e^{2t} \checkmark \checkmark$$

$$y = ?$$

$$y = \frac{dx}{dt}$$

$$y = c_1 e^t + 2c_2 e^{2t} //$$

$$\frac{dx}{dt} = y \checkmark$$

$$\frac{dy}{dt} = -2x + 3y$$

② Metode Advan Cramer

$$Dx = y$$

$$Dy = -2x + 3y$$

$$Dx - y = 0 \rightarrow Dx - y = 0$$

$$+2x + Dy - 3y = 0 \rightarrow 2x + (D-3)y = 0$$

$$x = \frac{\det(A_1)}{\det(A)} \quad A, A_1, A_2 \text{ matrix}$$

$$y = \frac{\det(A_2)}{\det(A)}$$

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}_{2 \times 2}$$

$$\det(A) = a \cdot d - b \cdot c$$

$$A = \begin{bmatrix} D & -1 \\ 2 & D-3 \end{bmatrix}_{2 \times 2}$$

$$A_1 = \begin{bmatrix} 0 & -1 \\ 0 & D-3 \end{bmatrix}_{2 \times 2}$$

$$A_2 = \begin{bmatrix} D & 0 \\ 2 & 0 \end{bmatrix}_{2 \times 2}$$

$$x = \frac{0-0}{D(D-3)+2} = \frac{0}{D^2-3D+2}$$

$$(D^2-3D+2)x = 0$$

$D = m$

$$m^2 - 3m + 2 = 0$$

$$m_1 = 1 \vee m_2 = 2$$

$$x = c_1 e^t + c_2 e^{2t}$$

$$y = \frac{0-0}{D^2-3D+2}$$

$$(D^2-3D+2)y = 0$$

$$y = c_3 e^t + c_4 e^{2t} \rightarrow y = c_1 e^t + 2c_2 e^{2t} //$$

$$y = \frac{dx}{dt}$$

$$c_3 e^t + c_4 e^{2t} = c_1 e^t + 2c_2 e^{2t}$$

$$c_3 = c_1$$

$$c_4 = 2c_2$$

Carilah solusi umum
dari PD simultan berikut!

$$\frac{dx}{dt} = 2x - y \quad \dots (1)$$

$$\frac{dy}{dt} = x + y \quad \dots (2)$$

$$(1) \rightarrow y = 2x - \frac{dx}{dt} \quad \dots (3)$$

$$\frac{dy}{dt} = 2 - \frac{d^2x}{dt^2} \quad \dots (4)$$

$$(3) \& (4) \rightarrow (2)$$

$$2 - \frac{d^2x}{dt^2} = x + \left(2x - \frac{dx}{dt}\right)$$

$$0 = -2 + \frac{d^2x}{dt^2} + x + 2x - \frac{dx}{dt}$$

$$\frac{d^2x}{dt^2} - \frac{dx}{dt} + 3x - 2 = 0$$

$$\frac{dx}{dt} = 2x - y \quad ; \quad \frac{dy}{dt} = x + y$$

$$y = 2x - \frac{dx}{dt} \quad \frac{dy}{dt} = x + 2x - \frac{dx}{dt}$$

$$\frac{d^2x}{dt^2} = 2 - \frac{dy}{dt} \quad y = 2x - \frac{dx}{dt}$$

$$\frac{d^2x}{dt^2} = 2 - x - 2x + \frac{dx}{dt}$$

$$\frac{d^2x}{dt^2} - \frac{dx}{dt} + 3x - 2 = 0$$

$$\frac{d^2x}{dt^2} - \frac{dx}{dt} + 3x = 2e^0$$

$$(D^2 - D + 3)x = 2e^0$$

$$D = m$$

$$m^2 - m + 3 = 0 \quad ; \quad D = 1 - 12$$

$$m_{1,2} = \frac{1 \pm \sqrt{11}i}{2} \quad = -11$$

$$x_h = e^{\frac{1}{2}t} \left(C_1 \cos \frac{\sqrt{11}}{2}t + C_2 \sin \frac{\sqrt{11}}{2}t \right)$$

$$x_k = \frac{2e^0}{D^2 - D + 3}$$

$$= \frac{2}{3}e^0$$

$$x = e^{\frac{1}{2}t} \left(C_1 \cos \frac{\sqrt{11}}{2}t + C_2 \sin \frac{\sqrt{11}}{2}t \right) + \frac{2}{3}$$

$$y = 2x - \frac{dx}{dt}$$

$$y = 2$$