

$$\frac{dx(t)}{dt} = Ax(t), \quad x(0) = X_0$$

$$x(t) = X_0 \left(I + At + \frac{1}{2} A^2 t^2 + \frac{1}{6} A^3 t^3 + \frac{1}{24} A^4 t^4 + \dots \right)$$

check:

$$* x(0) = X_0 (I + 0 + 0 + \dots) = X_0 \quad \checkmark$$

$$\begin{aligned} * \frac{dx(t)}{dt} &= X_0 \left(A + A^2 t + \frac{1}{2} A^3 t^2 + \frac{1}{6} A^4 t^3 + \dots \right) \\ &= AX_0 \left(I + At + \frac{1}{2} A^2 t^2 + \frac{1}{6} A^3 t^3 + \dots \right) \\ &= Ax(t) \quad \checkmark \end{aligned}$$

$$I + At + \frac{1}{2} A^2 t^2 + \frac{1}{6} A^3 t^3 + \dots \equiv [e^{At}]_{\text{matriks } [n \times n] \text{ + transisi}}$$

Solusi (tanpa input) $\rightarrow$ $x(t) = X_0 e^{At}$ $\rightarrow$ homogenous