$$A = \begin{bmatrix} 2 & 1 & 4 \\ 3 & -2 & 2 \\ 1 & 2 & -1 \end{bmatrix}$$

$$\frac{d}{dt} e^{At} = A e^{At}$$

$$\left[\frac{d}{dt} e^{At} \right]_{t=0} = A \cdot I.$$

$$A = \begin{bmatrix} 2 & 1 & 4 \\ 3 & -2 & 2 \\ 1 & 2 & -1 \end{bmatrix}$$

matricial

$$\Rightarrow \quad e^{At} = B_0(t)\, I + B_1(t)\, A + B_2(t)\, A^2 \quad \longleftarrow$$

ecuac. Carac $\quad \det(A - \lambda I) = 0$

$$\begin{vmatrix} 2-\lambda & +1 & +4 \\ 3 & -2-\lambda & 2 \\ 1 & 2 & -1-\lambda \end{vmatrix} = 0$$

$$(2-\lambda)\begin{vmatrix} -2-\lambda & 2 \\ 2 & -1-\lambda \end{vmatrix} - \begin{vmatrix} 3 & 2 \\ 1 & -1-\lambda \end{vmatrix} + 4\begin{vmatrix} 3 & -2-\lambda \\ 1 & 2 \end{vmatrix} = 0$$

$$(2-\lambda)\left[(-2-\lambda)(-1-\lambda) - 4\right] - \left[3(-1-\lambda) - 2\right] + 4\left[6 - (-2-\lambda)\right] = 0$$

$$(2-\lambda)(\lambda^2 + 3\lambda - 2) - (-3\lambda - 5) + (4\lambda + 32) = 0$$

$$-\lambda^3 - 3\lambda^2 + 2\lambda + 2\lambda^2 + 6\lambda - 4 + 3\lambda + 5 + 4\lambda + 32 = 0$$

$$-\lambda^3 - \lambda^2 + 15\lambda + 33 = 0$$

$$\lambda^3 + \lambda^2 - 15\lambda - 33 = 0$$

+	−	i
1	2	
1		2

(−λ) $\quad -\lambda^3 + \lambda^2 + 15\lambda - 33$

$$\boxed{\lambda_1 = 4.29} \qquad \boxed{\begin{aligned} \lambda_2 &= -2.64 + 0.83i \\ \lambda_3 &= -2.64 - 0.83i \end{aligned}}$$

$$e^{\lambda_i t} = B_0 + \lambda_i B_1 + \lambda_i^2 B_2$$

$$e^{4.29t} = B_0 + 4.29 B_1 + 18.40 B_2$$

$$e^{(-2.64+0.83i)t} = B_0 + (-2.64+0.83i) B_1 + (-2.64+0.83i)^2 B_2$$

$$e^{(-2.64-0.83i)t} = B_0 + (-2.64-0.83i) B_1 + (-2.64-0.83i)^2 B_2$$

$$e^{4.29t} = B_0 + 4.29 B_1 + 18.40 B_2$$

$$e^{-2.64t}\left(\cos(0.83t) + \operatorname{sen}(0.83t)\, i\right) = (B_0 - 2.64 B_1) + 0.83 B_1 i + (6.97 - 0.69) B_2 - 4.38 i B_2$$

$$e^{-2.64t}\left(\cos(0.83t) - \operatorname{sen}(0.83t)\, i\right) = (B_0 - 2.64 B_1 + 6.28 B_2) + (-0.83 B_1 + 4.38 B_2)\, i$$

$$e^{4.28t} = B_0 + 4.29 B_1 + 18.40 B_2$$

$$e^{-2.64t} \cos(0.83t) = B_0 - 2.64 B_1 + 6.28 B_2$$

$$+ e^{-2.64t} \operatorname{sen}(0.83t) = +0.83 B_1 - 4.38 B_2$$