

$$t, \theta_1, \theta_2, \theta_3, \Gamma_1, \dot{\theta}_1, \dot{\theta}_2, \dot{\theta}_3, \dot{\Gamma}_1$$

1 2 3 4

Scribe

D M A

$$E_n \times f_1 = \Gamma_1 \cos \theta_1 - \Gamma_2 \cos \theta_2 + \Gamma_3 \cos \theta_3 = 0$$

$$E_y f_2 = \Gamma_1 \sin \theta_1 - \Gamma_2 \sin \theta_2 + \Gamma_3 \sin \theta_3 = 0$$

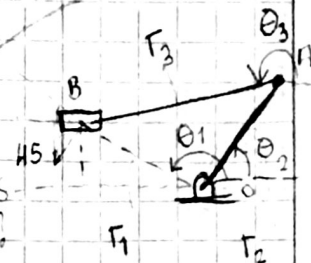
$$\Gamma_1 = \Gamma_2 + \Gamma_3$$

$$\theta_3 = \theta_2 = \theta$$

$$-\Gamma_1 \cos(\theta_1) = 1$$

$$\Gamma_1 \sin(180 - \theta_1) = 45$$

$$\Gamma_1 \cos(180 - \theta_1) = ?$$



$$\Gamma_1 - \Gamma_2 - \Gamma_3 = 0$$

$$E_n \times f_1 = -\Gamma_1 \cos \theta_1 - \Gamma_2 \cos \theta_2 - \Gamma_3 \cos \theta_3 = 0 \quad (1)$$

$$\Gamma_1 \sin \theta_1 = 45$$

$$E_n y f_2 = \Gamma_1 \sin \theta_1 - \Gamma_2 \sin \theta_2 - \Gamma_3 \sin \theta_3 = 0 \quad (2)$$

Incognitas θ_3

θ_1

Γ_1

$$E_n \times f_1 = \frac{45 \cos \theta_1}{\sin \theta_1} - \Gamma_2 \cos \theta_2 - \Gamma_3 \cos \theta_3 = 0$$

$$\Gamma_1 = \frac{45}{\sin \theta_1}$$

$$E_n y f_2 = 45 - \Gamma_2 \sin \theta_2 - \Gamma_3 \sin \theta_3 = 0$$

$$\frac{d f_3}{d t} \Gamma_1 \sin \theta_1 - 45 = 0$$

$$E_n \times f_1 = 45 \cot \theta_1 - \Gamma_2 \cos \theta_2 - \Gamma_3 \cos \theta_3 = 0 \quad (1)$$

$$\dot{\Gamma}_1 \sin \theta_1 + \Gamma_1 \dot{\theta}_1 \cos \theta_1 = 0$$

$$E_n y f_2 = 45 - \Gamma_2 \sin \theta_2 - \Gamma_3 \sin \theta_3 = 0 \quad (2)$$

$$45 - \Gamma_2 \sin \theta_2 = \Gamma_3 \sin \theta_3$$

$$\sin^{-1} \left(\frac{45 - \Gamma_2 \sin \theta_2}{\Gamma_3} \right) = \theta_3$$

$$45 \cot \theta_1 = \Gamma_2 \cos \theta_2 + \Gamma_3 \cos \theta_3$$

$$\theta_1 = \cot^{-1} \left(\frac{\Gamma_2 \cos \theta_2 + \Gamma_3 \cos \theta_3}{45} \right)$$

$$E_n \times \frac{d f_1}{d t} = -\dot{\Gamma}_1 \cos \theta_1 + \Gamma_1 \dot{\theta}_1 \sin \theta_1 + \Gamma_2 \dot{\theta}_2 \sin \theta_2 + \Gamma_3 \dot{\theta}_3 \sin \theta_3 = 0$$

$\dot{\Gamma}_1$

$\dot{\theta}_1$

$$E_n y \frac{d f_1}{d t} = \dot{\Gamma}_1 \sin \theta_1 + \Gamma_1 \dot{\theta}_1 \cos \theta_1 - \Gamma_2 \dot{\theta}_2 \cos \theta_2 - \Gamma_3 \dot{\theta}_3 \cos \theta_3 = 0$$

$\dot{\theta}_3$

$$\dot{\Gamma}_1 \sin \theta_1 + \Gamma_1 \dot{\theta}_1 \cos \theta_1 = 0$$

$$-17.8634 \times =$$

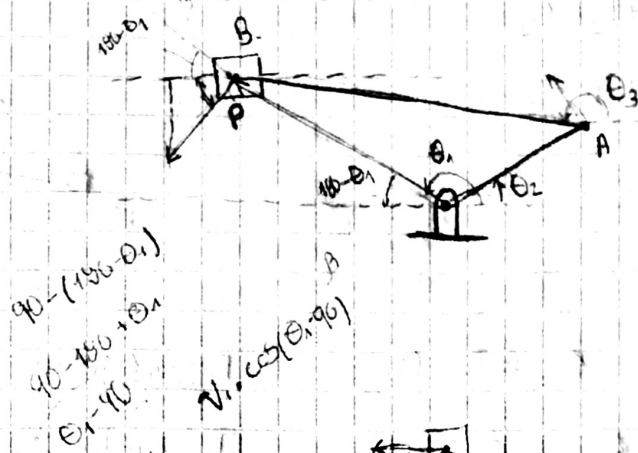
$$-23.899$$

$$\begin{bmatrix} \cos \theta_1 - \Gamma_1 \sin \theta_1 + \Gamma_2 \dot{\theta}_2 \sin \theta_2 + \Gamma_3 \dot{\theta}_3 \sin \theta_3 \\ \sin \theta_1 + \Gamma_1 \cos \theta_1 - \Gamma_2 \dot{\theta}_2 \cos \theta_2 - \Gamma_3 \dot{\theta}_3 \cos \theta_3 \\ \sin \theta_1 + \Gamma_1 \cos \theta_1 \end{bmatrix} \begin{bmatrix} \dot{\Gamma}_1 \\ \dot{\theta}_1 \\ \dot{\theta}_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} \cos \theta_1 - \Gamma_1 \sin \theta_1 + \Gamma_3 \dot{\theta}_3 \sin \theta_3 \\ \sin \theta_1 + \Gamma_1 \cos \theta_1 - \Gamma_3 \dot{\theta}_3 \cos \theta_3 \\ \sin \theta_1 + \Gamma_1 \cos \theta_1 \end{bmatrix} \begin{bmatrix} \dot{\Gamma}_1 \\ \dot{\theta}_1 \\ \dot{\theta}_3 \end{bmatrix} = \begin{bmatrix} -\Gamma_2 \dot{\theta}_2 \sin \theta_2 \\ \Gamma_2 \dot{\theta}_2 \cos \theta_2 \\ 0 \end{bmatrix}$$

A

B



$$V_{A1} = \omega_2 r_2$$

$$V_A = \dot{\theta}_2 r_2$$

$$V_B = V_{B/A} + V_A$$

$$V_B = \dot{\theta}_3 r_3 + \dot{\theta}_2 r_2$$

$$\vec{V}_B = \vec{V}_A + \vec{V}_{P/A} + \vec{V}_{P/B}$$

$$\vec{V}_B - \vec{V}_A - \vec{V}_{P/A} = \vec{V}_{P/B}$$

$$r_3 \dot{\theta}_3 - \dot{\theta}_2 r_2 - \dot{\theta}_3 r_3 = V_{P/B}$$