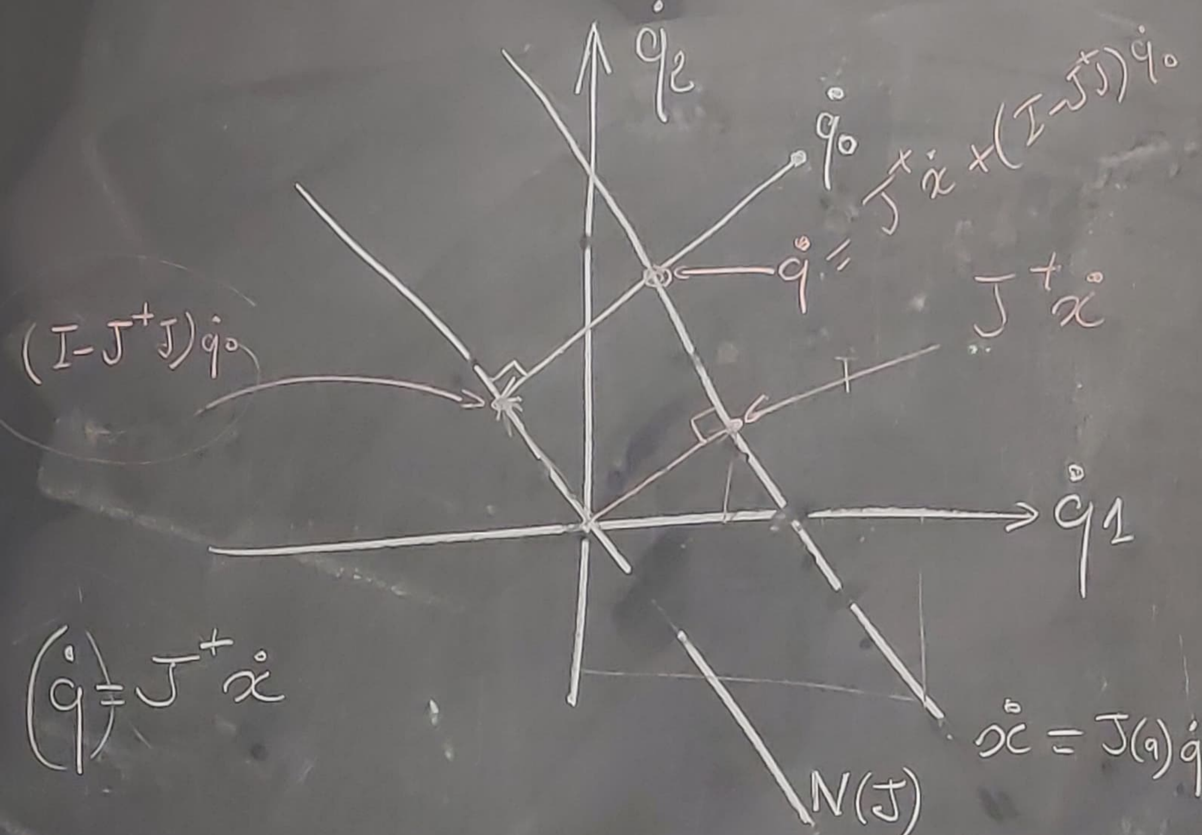


$$\dot{q} = J^+\dot{x}$$

$$\boxed{\dot{x} = \underbrace{\begin{bmatrix} j_{11} & j_{12} \end{bmatrix}}_{J(q)} \begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \end{bmatrix}} = j_{11}\dot{q}_1 + j_{12}\dot{q}_2$$

$$J\dot{q} = 0$$

$$\min_{\dot q} \frac{1}{2} \dot q^T W \dot q$$

$$\text{sc} \quad \dot x - J \dot q = 0$$

$$L = \frac{1}{2} \dot q^T W \dot q + \lambda^T (\dot x - J \dot q)$$

$$\nabla L_{\dot q} = 0 \qquad W \dot q - J^T \lambda = 0$$

$$\nabla L_{\lambda} = 0 \longrightarrow \dot x - J \dot q = 0$$

$$= \frac{1}{2}\left[\dot{q}_1 \,\vdots\, \dot{q}_2\right]\left[\begin{array}{c|c} a & b \\ \hline b & c \end{array}\right]\left[\begin{array}{c} \dot{q}_1 \\ \dot{q}_2 \end{array}\right]$$

$$\left[\begin{array}{c} a\dot{q}_1 + b q_2 \\ b\dot{q}_1 + c\dot{q}_2 \end{array}\right]$$

$$= \frac{1}{2}\left[\underset{1000}{\underset{\uparrow}{a}}\dot{q}_1^2 + \underset{0.1}{\underset{\uparrow}{c}}\dot{q}_2^2 + 2\dot{q}_1\dot{q}_2 b\right]$$

$$J = U \Sigma V^T$$

$$\dot{x}$$

$$\dot{q} = J^{+} \dot{x}$$

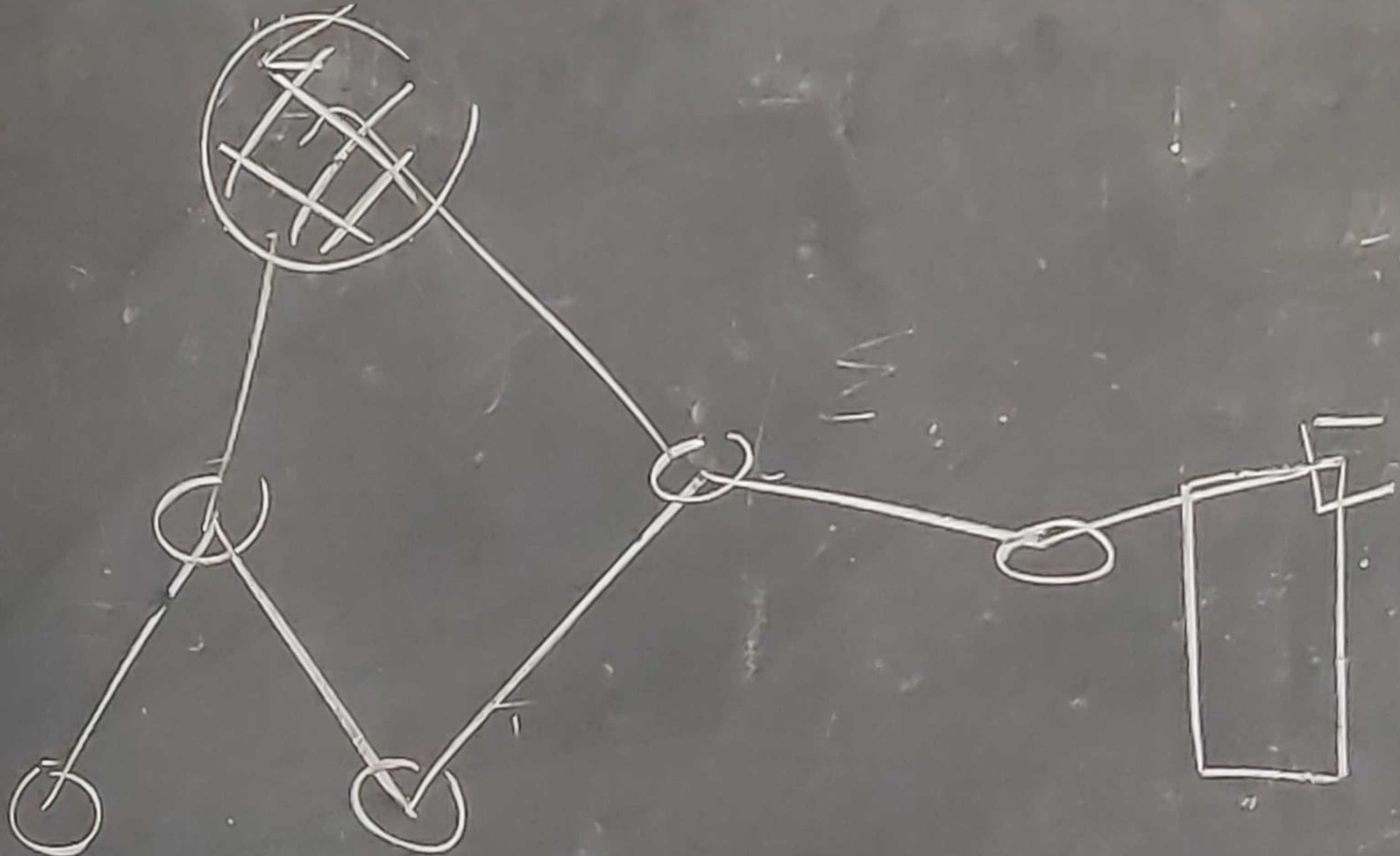
$$J^T = V \Sigma^T U^T$$

$$\left[U \left[\Sigma \Sigma^T + \mu^2 I \right] U^T \right]^{-1}$$

$$J_{DLS} = V \Sigma^T U^T \left[U \Sigma \Sigma^T U^T + \mu^2 U U^T \right]^{-1}$$

$$= V \Sigma^T \cancel{U^T} \cancel{U} \left[\Sigma \Sigma^T + \mu^2 I \right]^{-1} U^T$$

$$= V \underbrace{\left[\Sigma^T \left[\Sigma \Sigma^T + \mu^2 I \right]^{-1} \right]}_{\Sigma_{DLS}} U^T$$



$$\bar{J}_A = \begin{bmatrix} J_{11} & J_{12} \\ -s_1 & 0 \end{bmatrix}$$

$$\det \bar{J}_A = s_1 \cdot J_{12}$$

$$\bar{J}_A = \begin{bmatrix} J \\ J_\varphi \end{bmatrix}$$

$\uparrow$

$n \times n$

$$y = \cos(q_1)$$

$$\dot{y} = -\sin(q_1)\,\dot{q}_1$$