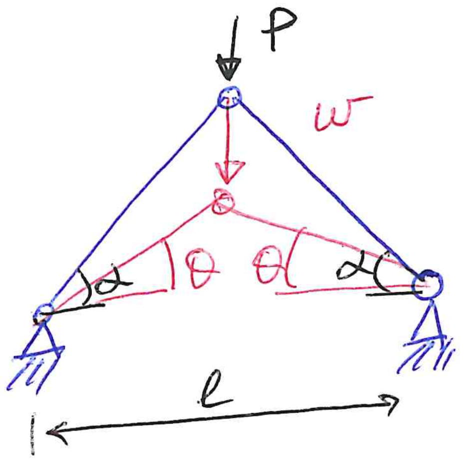
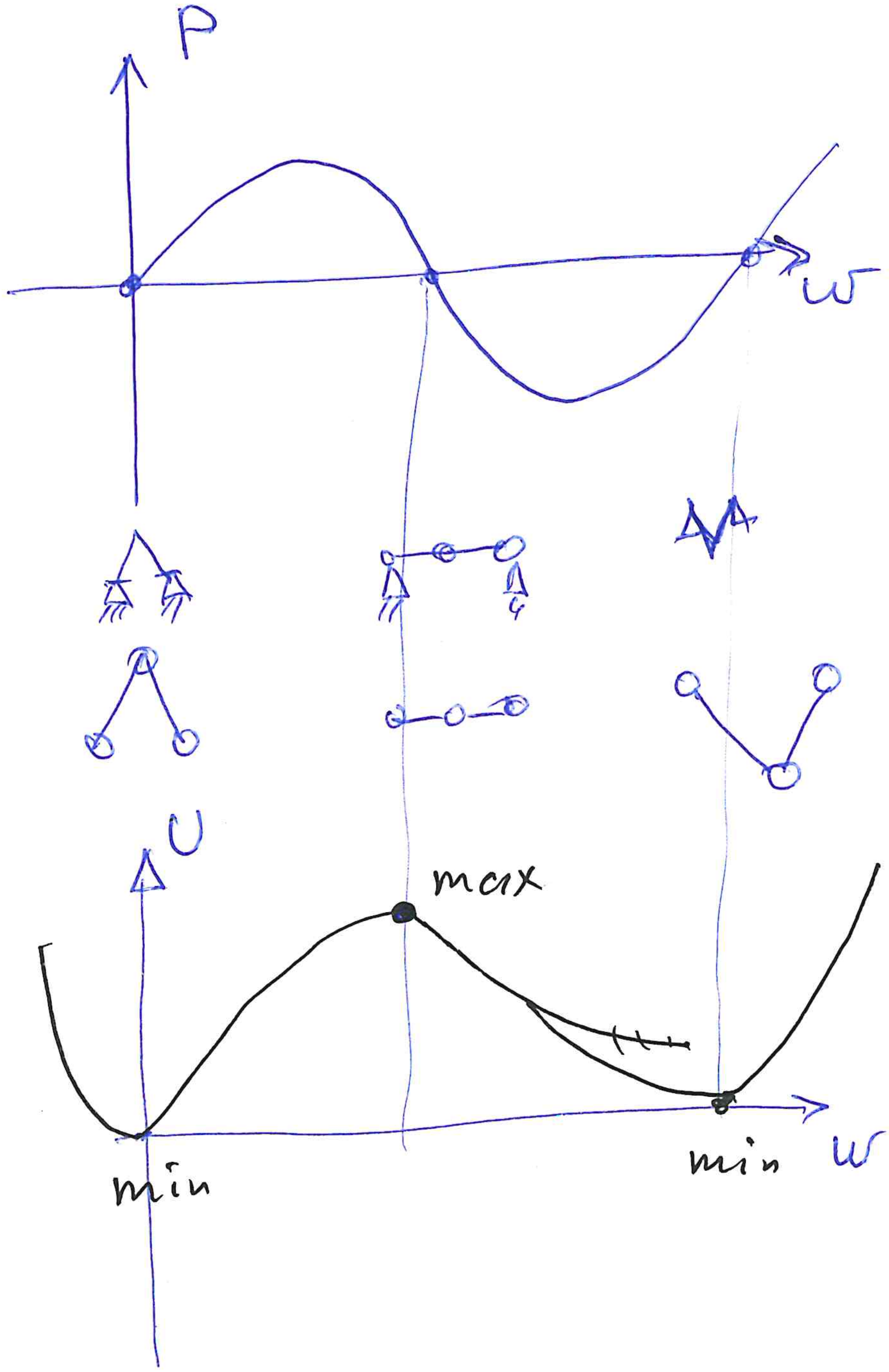
von Mises truss



simmetrico

P − w



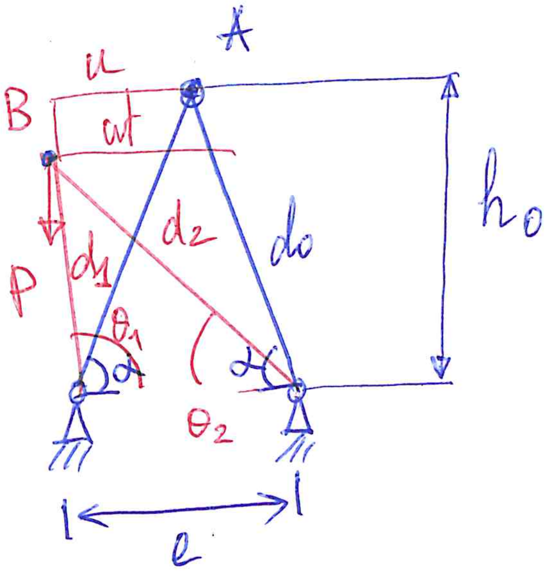
$$\Pi = U - \underbrace{Pw}_{V}$$

$$U = U(w)$$

$$P = \frac{\partial U}{\partial w}$$

$P = 0 \Rightarrow$

U − max
min



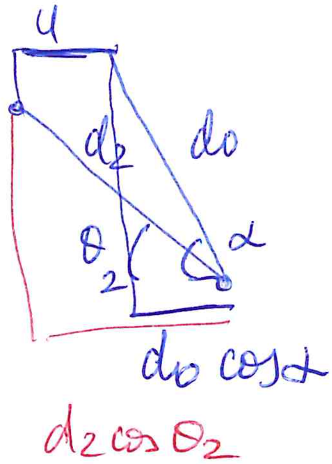
$$h_0 = \frac{\ell}{2}\tan\alpha$$

$$d_0 \cos\alpha = \frac{\ell}{2}$$

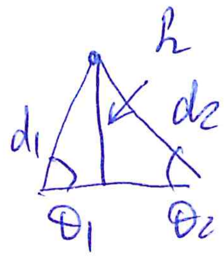
$$d_0 = \frac{\ell}{2\cos\alpha}$$

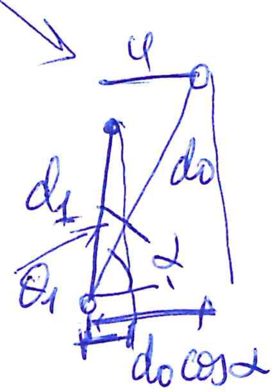
$A \to B$

$$\begin{cases} d_0\cos\alpha + u = d_2\cos\theta_2 \\ d_0\cos\alpha - u = d_1\cos\theta_1 \end{cases}$$

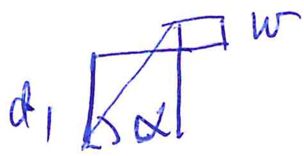


$$d_1\sin\theta_1 = d_2\sin\theta_2$$





$$\begin{cases} \overbrace{d_0\sin\alpha}^{h_0} - \overbrace{d_1\sin\theta_1}^{h} = w \\ d_0\sin\alpha - d_2\sin\theta_2 = w \end{cases}$$



$\theta_1, \theta_2, d_1, d_2$

$$\Pi, \mathcal{V} = \Pi, \mathcal{V}(u, w)$$

$$\theta_1, \theta_2 \to u, w$$

$$\cos\theta_2 = \frac{d_0 \cos\alpha + u}{d_2}$$

$$\cos\theta_1 = \frac{d_0 \cos\alpha - u}{d_1}$$

$$\sin\theta_1 = \frac{d_0 \sin\alpha - w}{d_1}$$

$$\sin\theta_2 = \frac{d_0 \sin\alpha - w}{d_2}$$

$$\cos^2\theta_1 + \sin^2\theta_1 = 1 \qquad \cos^2\theta_2 + \sin^2\theta_1 = 1$$

$$(d_0 \cos\alpha + u)^2 + (d_0 \sin\alpha - w)^2 = d_2^2$$

$$(d_0 \cos\alpha - u)^2 + (d_0 \sin\alpha - w)^2 = d_1^2$$

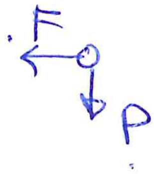
$$\Rightarrow d_1, d_2 = d_{1,2}(u, w)$$

$$d_1 = \sqrt{(d_0 \cos\alpha - u)^2 + (d_0 \sin\alpha - w)^2}$$

$$d_2 = \ldots$$

$$U = \frac{1}{2} k \, \Delta d_1^{\,2} + \frac{1}{2} k \, \Delta d_2^{\,2}$$

$$\Delta d_1 = d_1 - d_0 \,, \quad \Delta d_2 = d_2 - d_0$$



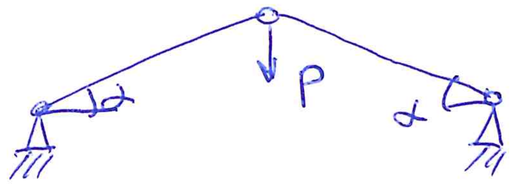
$$U = U(u, w)$$

$$P = \frac{\partial U}{\partial w} \,, \quad F = \frac{\partial U}{\partial u}$$

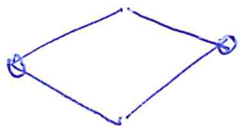
$$F = 0 \implies \frac{\partial U}{\partial u} = 0 \implies u = u(w)$$

$$\implies \underline{P = \frac{\partial U}{\partial w}\left(u(w), w \right) = \hat{P}(w)}$$

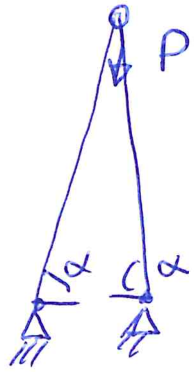
I.



1. $P_{c\,min}$ — simmetrico

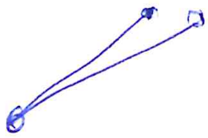


II.

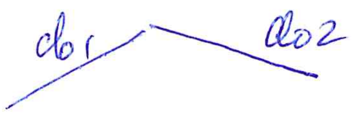


$\alpha > \alpha^*$

$P_{c\,min} \rightarrow$ non-simm.

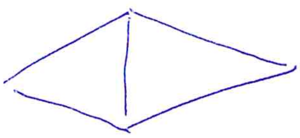


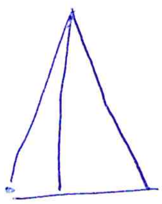
2. Sistema imperfette



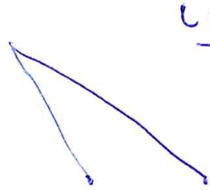
$\alpha_{01} \neq \alpha_{02}$

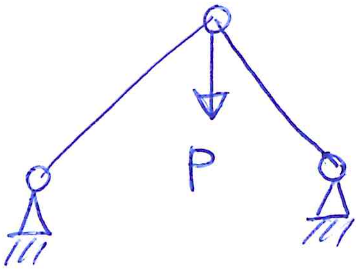
non important

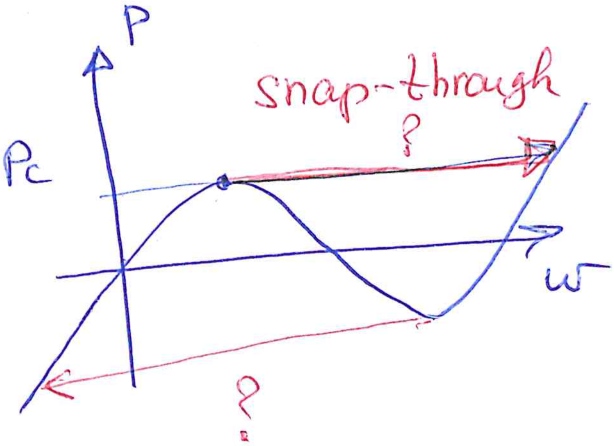


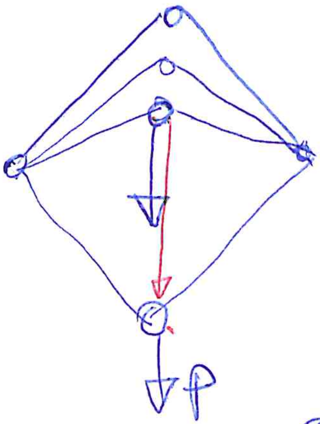


important

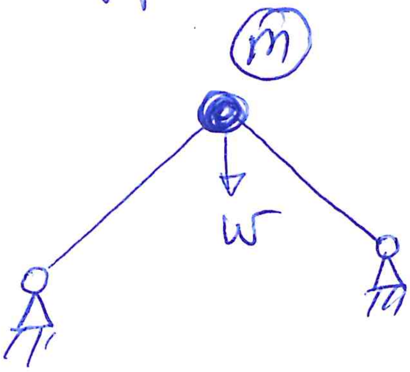








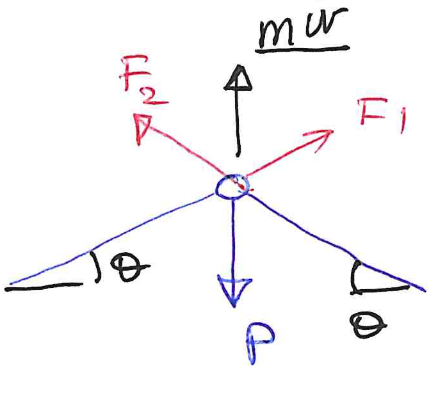
$\boxed{\text{dinamico}}$



? il criterio dinamico

$$K = \frac{1}{2} m \dot{w}^2$$

$$\underline{w = w(t)}$$



$$F_1 = F_2 = F$$

$$\underline{P = 2F\sin\theta + m\ddot{w}}$$

moto

Hamilton

$$H = \int_{t_1}^{t_2} (K - \Pi)\, dt$$

$$\delta H = 0 \qquad K = \frac{1}{2} m \dot{w}^2$$

$$\Pi = U(w) - P w$$

$$\delta H = \int_{t_1}^{t_2} \left[m \dot{w} \delta \dot{w} - \frac{\partial U}{\partial w} \delta w + P \delta w \right] dt$$

$$= \int_{t_1}^{t_2} \underbrace{\left[- m \ddot{w} - \frac{\partial U}{\partial w} + P \right]} \delta w \, dt + \ldots$$

$$\forall \delta w \qquad - m \ddot{w} - \frac{\partial U}{\partial w} + P = 0$$

l'equazione del moto

$$m \ddot{w} = P - \frac{\partial U}{\partial w}$$

$$w = \text{cost} \implies P = \frac{\partial U}{\partial w} \ : \ \underline{\text{equilibrio}}$$

$$m\ddot{w} = P - \frac{\partial U}{\partial w} \quad \Big| \quad \dot{w}$$

$$m\ddot{w}\dot{w} = P\dot{w} - \frac{\partial U}{\partial w}\dot{w}$$

$$\left(\frac{1}{2}m\dot{w}^2\right)^{\circ} = \left[Pw - U\right]^{\circ}$$

$$(\ldots)^{\circ} = 0 \qquad (\ldots) = C$$

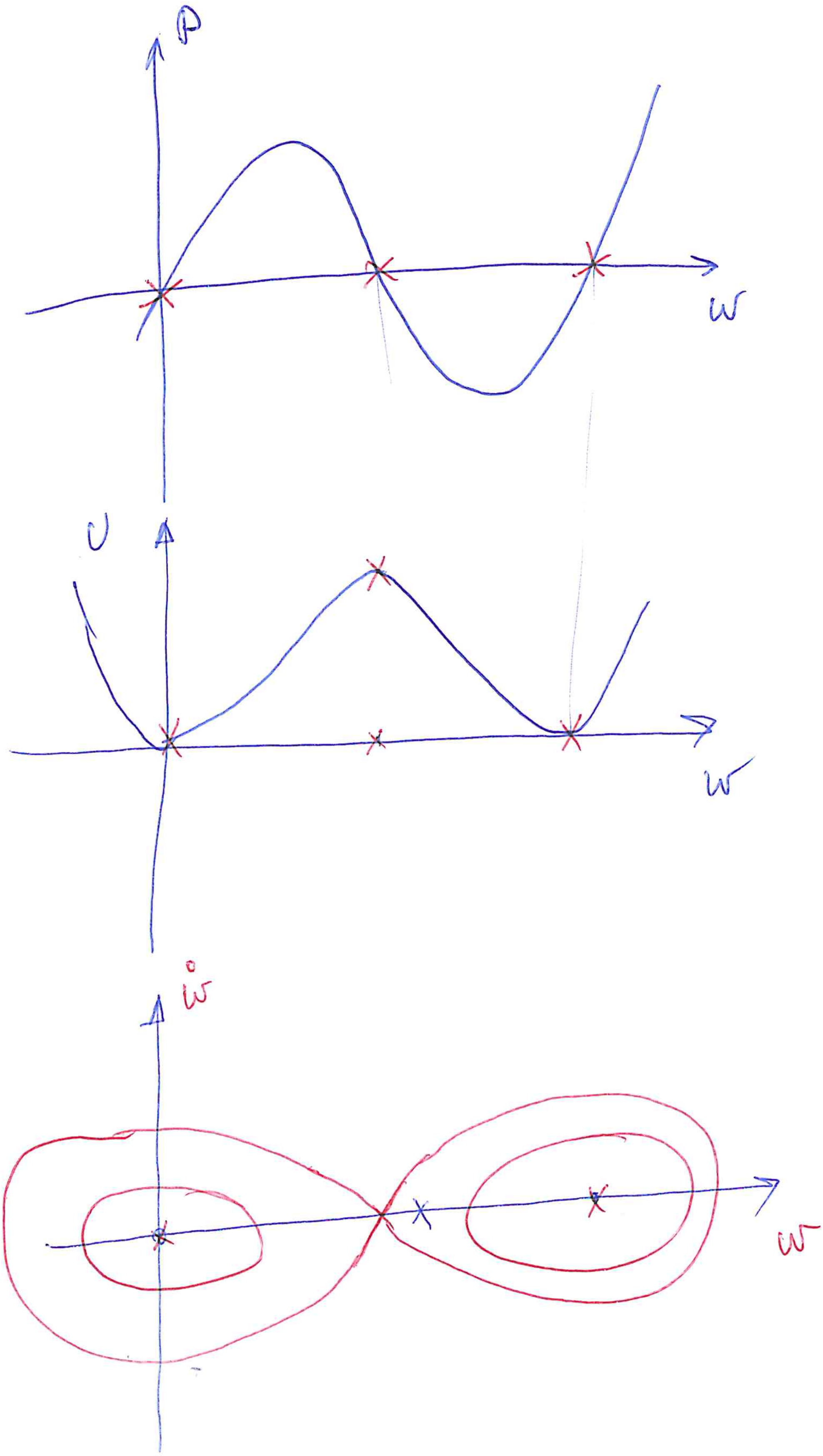
$$\boxed{\frac{1}{2}m\dot{w}^2 = Pw - U + C} \qquad C - ?$$

$$\dot{w}^2 = \frac{2}{m}\left[Pw - U + C\right]$$

$$\dot{w} = \pm\sqrt{\frac{2}{m}\left[Pw - U + C\right]}$$

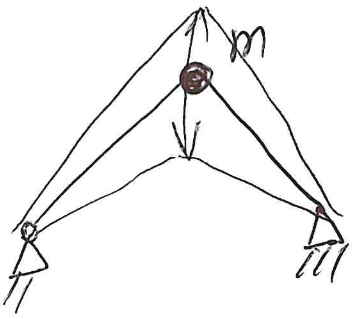
$$\pm \frac{dw}{\sqrt{\frac{2}{m}\left[Pw - U + C\right]}} = dt$$

$$\boxed{\pm \int_{w_0}^{w} \frac{dw}{\sqrt{\frac{2}{m}\left[Pw - U + C\right]}} = t}$$

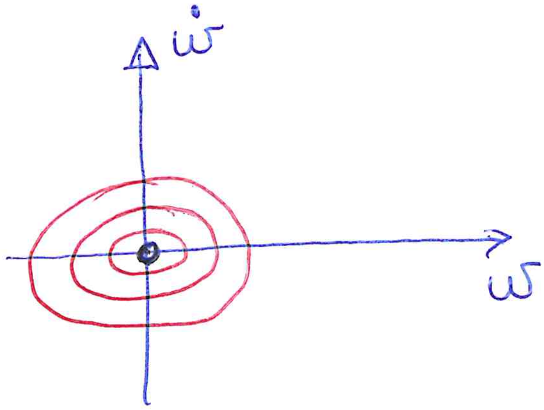


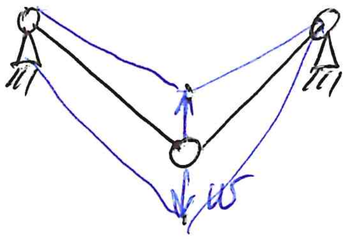
$p = 0$

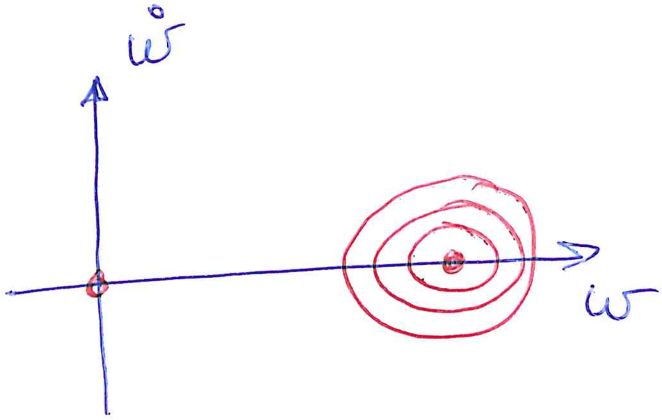
$P = 0$

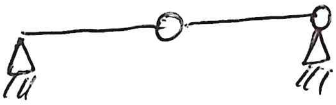


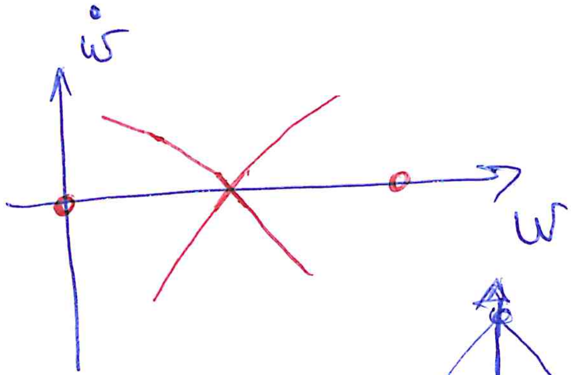
$\underline{w = w(t)}$

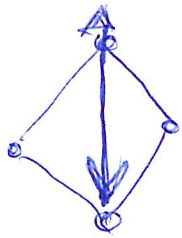


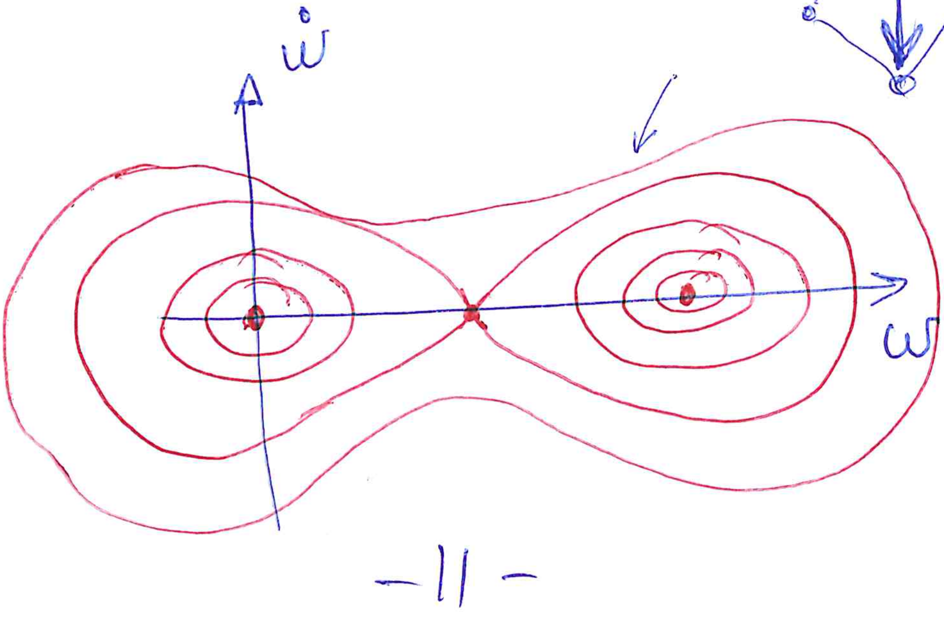












$$P = P_c$$

$$P = \frac{\partial U}{\partial w}$$