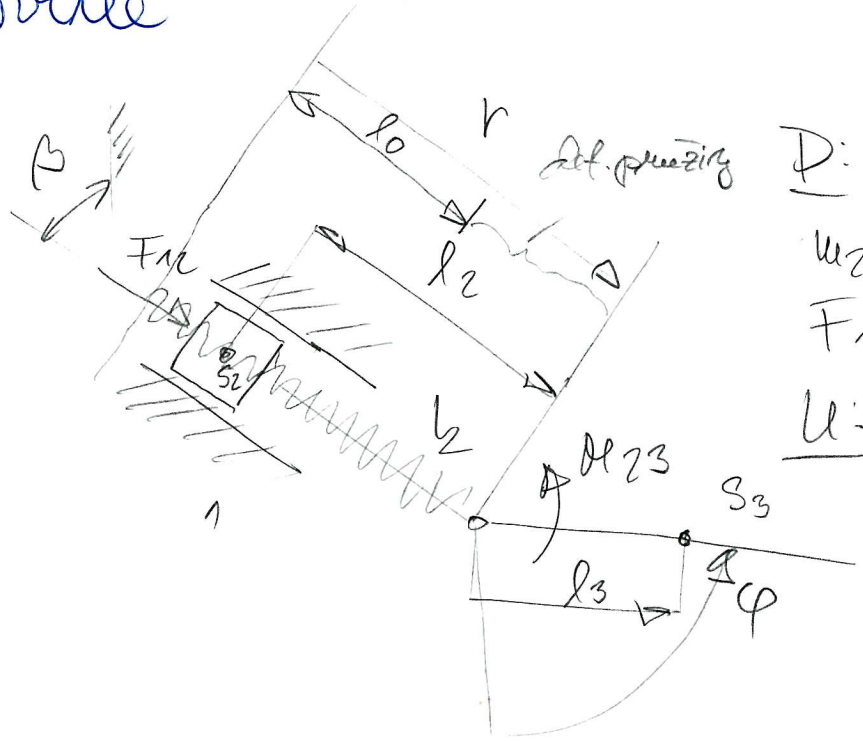
# Princip virt. prací v dynamice

hm. bod $m\ddot{\underline{r}} = \underline{F} \Rightarrow (\underline{F} - m\underline{a})\delta\underline{r} = 0$

tuhé těleso v rovině $I\ddot{\varphi} = M \Rightarrow (M - I\ddot{\varphi})\delta\varphi = 0$

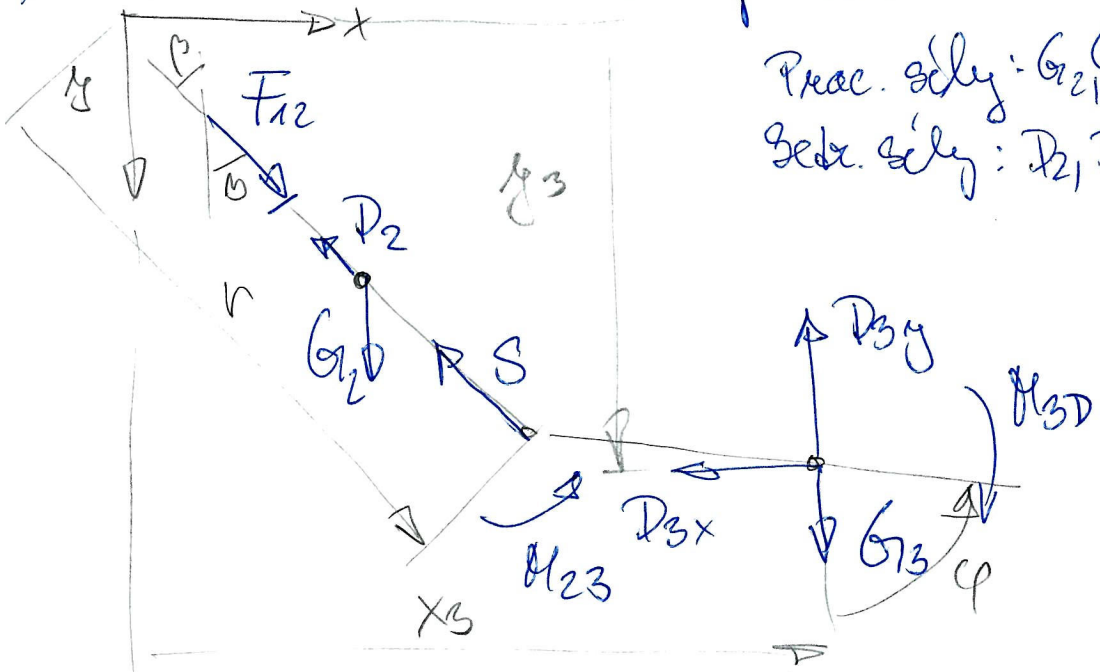



def. prvazby D: $l_2, l_3, \beta, \xi, l_0$
$m_2, m_3, I_{3S3}$
$F_{12}, M_{23}$

U: VPR pomocí PVP

$n = 3(3-1) - 1_{rot}\cdot 2^\circ - 1_{pos}\cdot 2^\circ = \underline{\underline{2^\circ \text{ vol.}}}$

vol. souřadnice $q = [r, \varphi]^T$




Přeč. síly: $G_2, G_3, S, F, M$
Sčkr. síly: $D_2, D_{3x}, D_{3y}, M_{3D}$

$$\delta W^{FID} = 0$$

$$(F - S + \cos\beta \cdot G_2 - D_2)\delta r + (M_{23} - M_{3D})\delta\varphi -$$

$$- D_{3x} \cdot \delta x_3 + (G_3 - D_{3y})\delta y_3 = 0$$

$$x_3 = f(r,\varphi) \qquad x_3 = r \cdot \sin\beta + l_3 \sin\varphi$$

$$y_3 = f(r,\varphi) \qquad y_3 = r\cos\beta + l_3\cos\varphi$$

$$\delta x_3 = \sin\beta\,\delta r + l_3\cos\varphi \cdot \delta\varphi$$

$$\delta y_3 = \cos\beta\,\delta r - l_3 \sin\varphi \cdot \delta\varphi$$

$$[F - S + \cos\beta G_2 - m_2 \cdot \ddot{r}]\delta r +$$

$$\hookrightarrow k(r - l_0)$$

$$+ (M_{23} - I_{333}\ddot{\varphi})\delta\varphi -$$

$$- m_3 \cdot \ddot{x}_3 \delta x_3 + [G_3 - m_3 \cdot \ddot{y}_3]\delta y_3 = 0$$

$$\dot{x}_3 = \dot{r}\sin\beta + l_3\cos\varphi \cdot \dot{\varphi}$$

$$\dot{y}_3 = \dot{r}\cos\beta - l_3\sin\varphi \cdot \dot{\varphi}$$

$$\ddot{x}_3 = \ddot{r}\sin\beta - l_3\sin\varphi \cdot \dot{\varphi}^2 + l_3\cos\varphi \cdot \ddot{\varphi}$$

$$\ddot{y}_3 = \ddot{r}\cos\beta - l_3\cos\varphi \cdot \dot{\varphi}^2 - l_3\sin\varphi \cdot \ddot{\varphi}$$

$$[F - c(r - l_0) + \cos\beta \cdot G_2 - m_2 \ddot{r}] \delta r +$$

$$+ [M_{23} - I_{333} \ddot{\varphi}] \delta\varphi -$$

$$- m_3 [\ddot{r} \sin\beta - l_3 \sin\varphi \dot{\varphi}^2 + l_3 \cos\varphi \cdot \ddot{\varphi}] (\sin\beta \delta r + l_3 \cos\varphi \delta\varphi) +$$

$$+ (G_3 - m_3 (\ddot{r} \cos\beta - l_3 \cos\varphi \cdot \dot{\varphi}^2 - l_3 \sin\varphi \ddot{\varphi})] (\cos\beta \delta r - l_3 \sin\varphi \cdot \delta\varphi) = 0$$

$\delta r, \delta\varphi$ nezávislé

$\delta r$: [ ] $= 0$

$\delta\varphi$: [ ] $= 0$

} 2x VPR