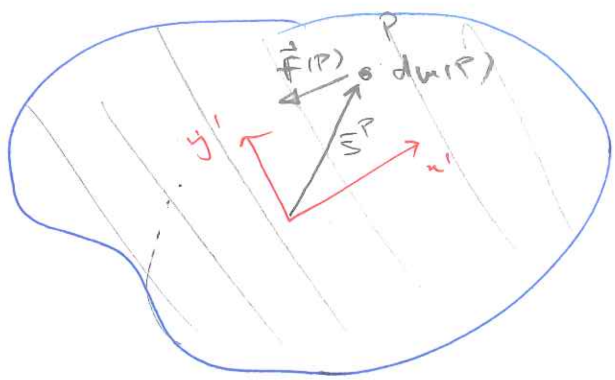
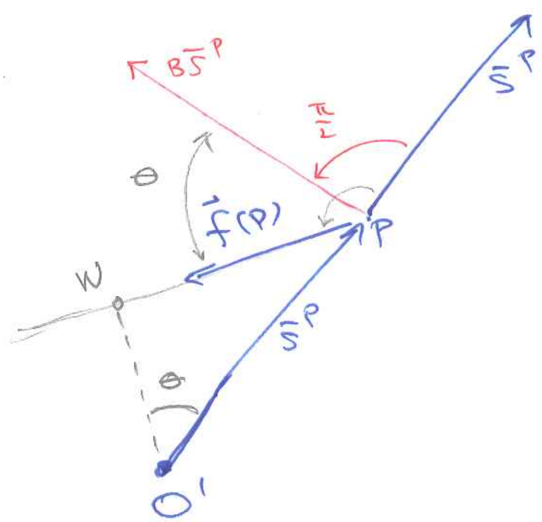


$$(B\bar{s}^P)^T \cdot f(P)$$



$$(B\bar{s}^P)^T \cdot f(P) = \underbrace{\|\bar{s}^P\| \cdot \|f(P)\| \cdot \cos\theta}$$

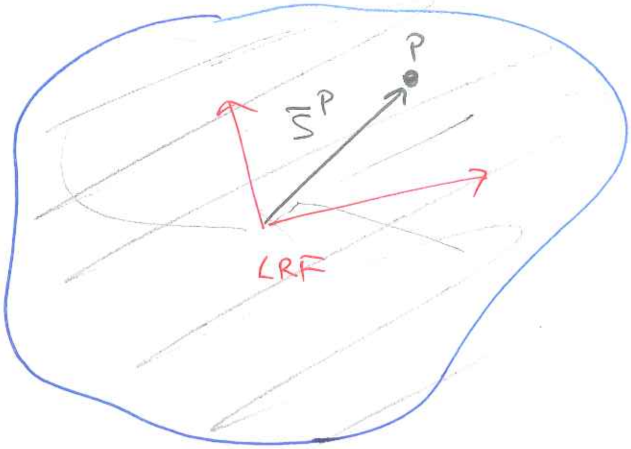
$$\|\bar{s}^P\| \cdot \cos\theta = \|O'W\|$$

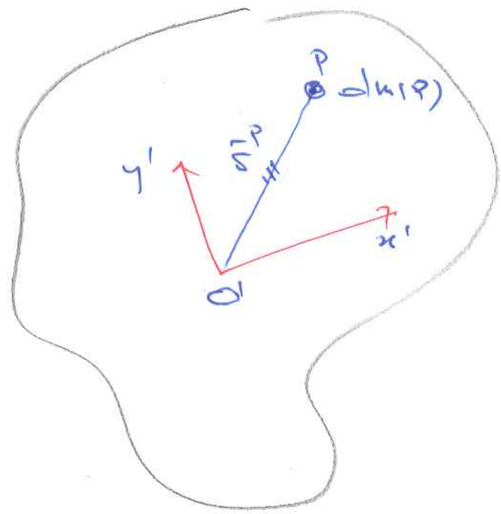
$$(B\bar{s}^P)^T \cdot f(P) = \underbrace{\|O'W\|}_{\text{arm}} \cdot \underbrace{\|f(P)\|}_{\text{magnitude of force}}$$

$$\delta r^T \cdot m\ddot{r} + \delta\varphi \cdot \bar{J} \cdot \ddot{\varphi} = \delta r^T \cdot F + \delta\varphi \cdot n$$

$$\delta r^T (m\ddot{r} - F) + \delta\varphi \cdot (\bar{J}\ddot{\varphi} - n) = 0$$

$$\boxed{\int_m B\,\bar{s}^P\,dm(P) = B\int_m \bar{s}^P\,dm(P)}$$





$$\int_m \bar{s}^{P^T}\cdot B^T\cdot f(P)\,dm(P)$$

$$\cancel{\int B\bar{s}^P f(P)\,dm(P) = B\int \bar{s}^P f(P)}$$

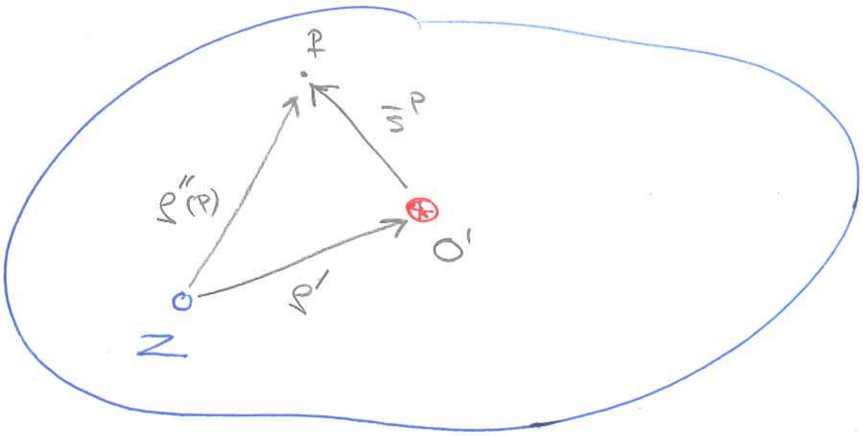
$$\int_m f^T(P)\cdot\rho\,dm(P) = \left[\int_m f^T(P)\,dm(P)\right]\cdot\rho$$

$$\|B\bar{s}^P\| = \|\bar{s}^P\|$$

$$\int_m \bar{s}^{PT}\cdot B^T\cdot B\cdot\bar{s}^P\,dm(P) = \int_m \overline{(\underline{\underline{B}}\bar{s}^P)^T\cdot(B\bar{s}^P)}\cdot dm(P)$$

$$= \int_m \overline{(\bar{s}^P)^T\cdot(\bar{s}^P)}\,dm(P)$$

$$= \bar{J}$$



$$\int_m \bar{s}^P \, dm(P) = 0$$

$$\int_m \bar{s}^P \, dm(P) = \int_m [\varrho''(P) - \varrho'] \, dm(P)$$

$$= \int_m \varrho''(P) \cdot dm(P) - \int_m \varrho' \, dm(P)$$

$$= \int_m \varrho''(P) \, dm(P) - \varrho' \int_m dm(P)$$

$$= \int_m \varrho''(P) \, dm(P) - \varrho' \cdot m = 0$$

$$\boxed{\varrho' = \frac{1}{m} \int_m \varrho''(P) \, dm(P)}$$