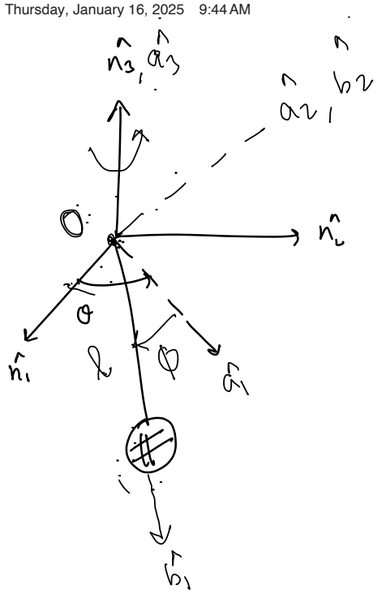
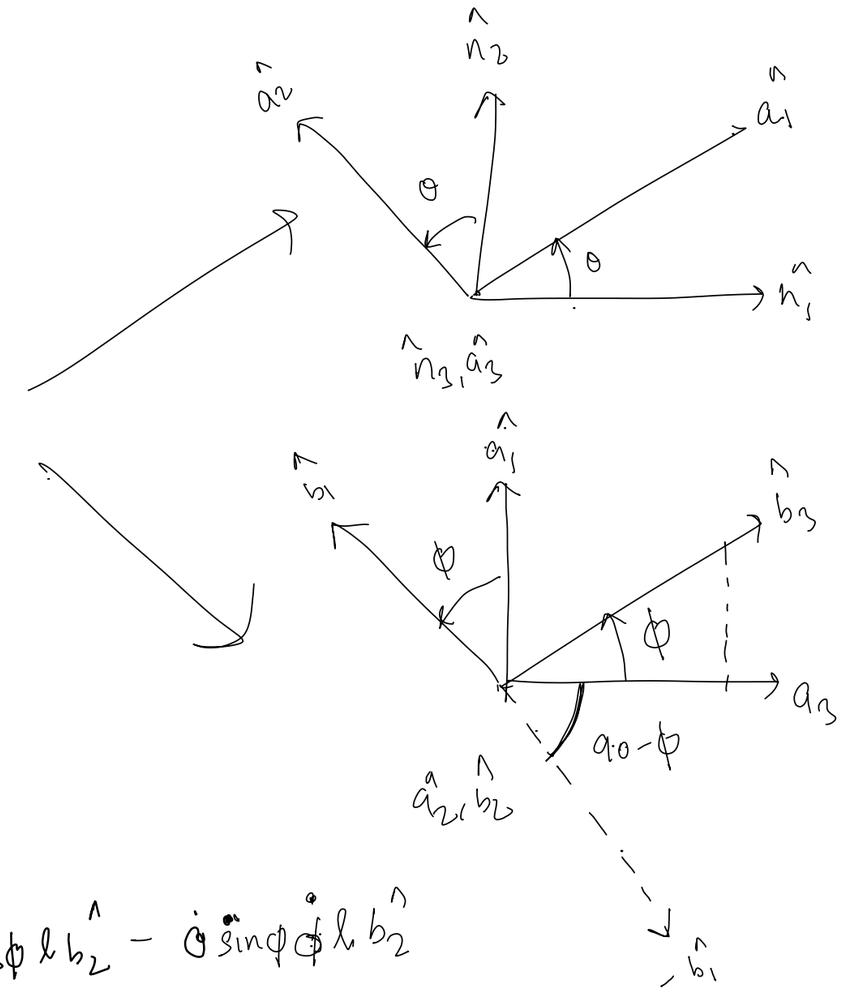
Lecture 2

Thursday, January 16, 2025 9:44 AM



Spherical Pendulum

$$\underline{P} = l\hat{b}_1$$



$$N\frac{d}{dt}\underline{v} = \left|\begin{array}{l} \ddot{\theta}\cos\phi\, l\hat{b}_2 - \dot{\theta}\sin\phi\,\dot{\phi}\, l\hat{b}_2 \\ + \underline{\omega}_{B/N} \times \left(\dot{\theta}\cos\phi\, l\hat{b}_2\right) + \\ - \ddot{\phi} l \hat{b}_3 - \underline{\omega}_{B/N} \times \left(\dot{\phi} l \hat{b}_3\right) \end{array}\right.$$

Inertial velocity

$$\underline{v} = l\dot{\hat{b}}_1$$

$$N\frac{d}{dt}(\underline{v}) = \frac{{}^{B}d}{dt}(l\hat{b}_1) + \underline{\omega}_{B/N} \times (l\hat{b}_1)$$

$$\underline{\omega}_{B/N} = \underline{\omega}_{A/N} - \underline{\omega}_{A/B}$$

$$= \dot{\theta}\hat{a}_3 + \dot{\phi}\hat{b}_2$$

$$\hat{a}_3 = \cos\phi\,\hat{b}_3 - \sin\phi\,\hat{b}_1$$

$$\left(\dot{\theta}(\cos\phi\,\hat{b}_3 - \sin\phi\,\hat{b}_1) + \dot{\phi}\hat{b}_2\right) \times (l\hat{b}_1)$$

$$\Rightarrow \left[\dot{\theta}\cos\phi\, l\hat{b}_2 - \dot{\phi} l \hat{b}_3\right]$$

LECTURE 3

Tuesday, January 21, 2025 8:10 AM

$$\left(\frac{d\underline{k}}{dt}\right)_J = \left(\frac{d\underline{k}}{dt}\right)_L + \underline{\omega}_{L/J} \times \underline{k}$$

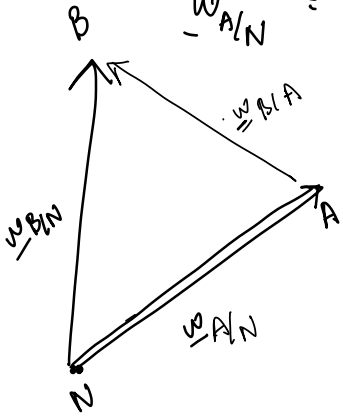
L frame

$$\left(\frac{d\underline{\omega}_{L/J}}{dt}\right)_J = \left(\frac{d\underline{\omega}_{L/J}}{dt}\right)_L$$

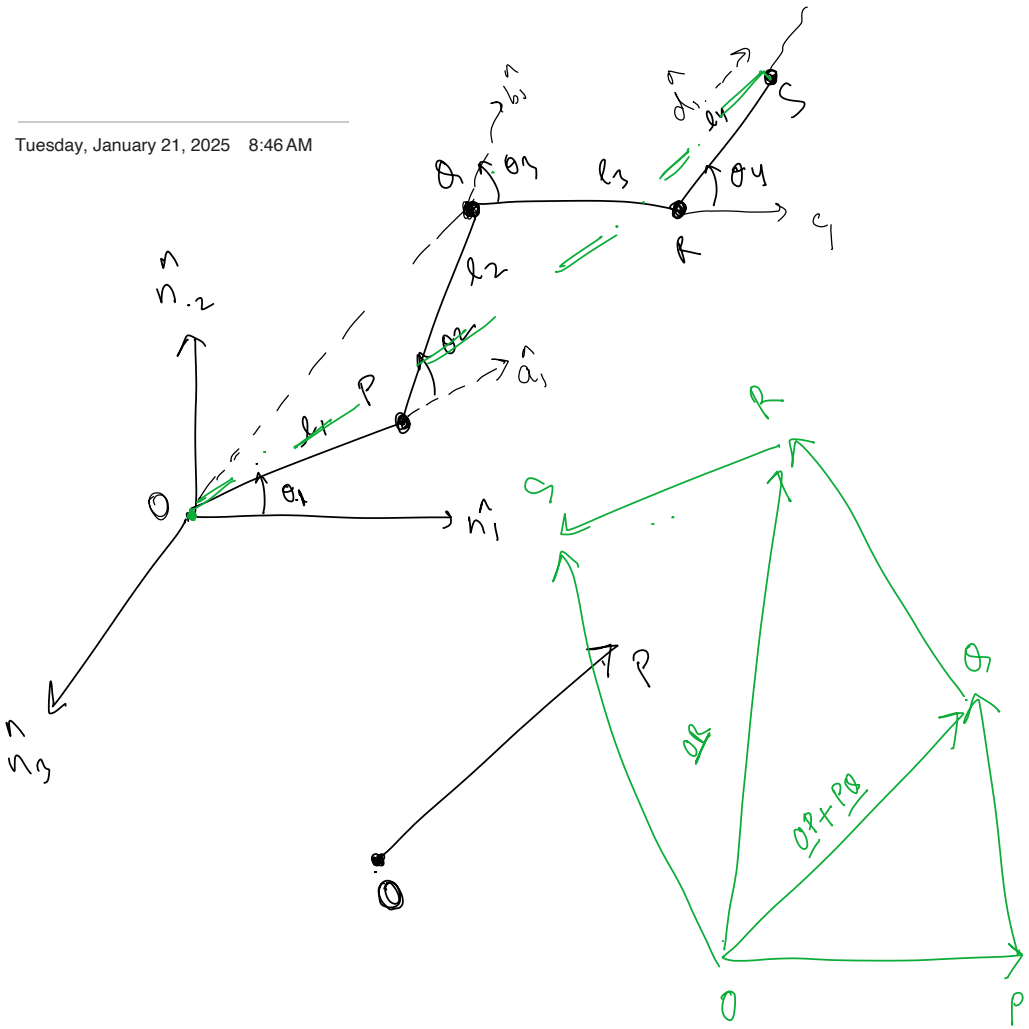
$\underline{\omega}$

$\underline{\omega}_{N/A} =$

$\underline{\omega}_{A/N} = -\underline{\omega}_{N/A}$



Tuesday, January 21, 2025 8:46 AM



$\underline{r_1} = \underline{OQ}$

$= l_1 \hat{a}_1 + l_2 \hat{b}_1$

$\underline{r_2} = \underline{OS}$

$=$

$\underline{OS} = \underline{OP} + \underline{PQ} + \underline{QR} + \underline{RS}$