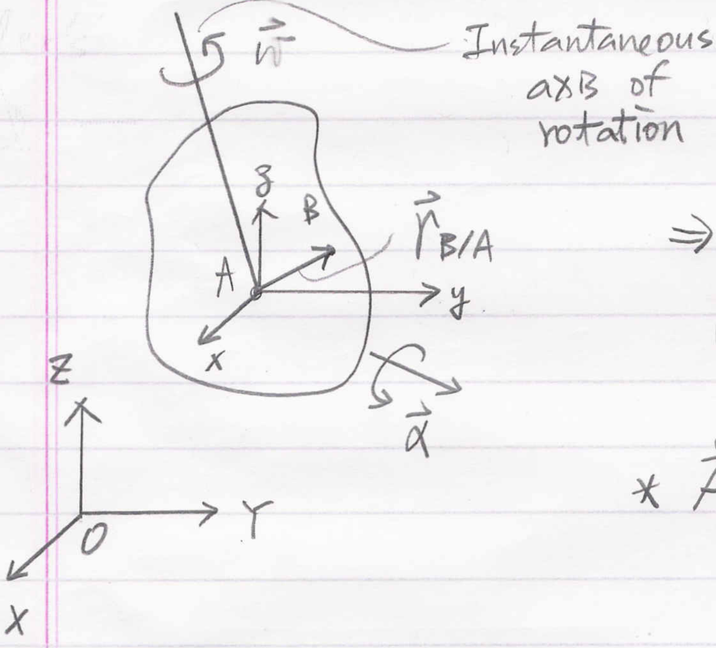
* Angular acceleration :

$$\boxed{\vec{\alpha} = \frac{d\vec{\omega}}{dt} = \dot{\vec{\omega}} = \ddot{\theta}}$$

* Linear velocity : $\boxed{\vec{v} = \vec{\omega} \times \vec{r}}$

* Linear acceleration: $\boxed{\vec{a} = \vec{\alpha} \times \vec{r} + \vec{\omega} \times (\vec{\omega} \times \vec{r})}$

General motion



$$\boxed{\vec{v}_B = \vec{v}_A + \vec{\omega} \times \vec{r}_{B/A}}$$

$$\Rightarrow \boxed{\vec{a}_B = \vec{a}_A + \vec{\alpha} \times \vec{r}_{B/A} + \vec{\omega} \times (\vec{\omega} \times \vec{r}_{B/A})}$$

$$* \ \dot{\vec{A}} = (\dot{\vec{A}})_{xyz} + \vec{\Omega} \times \vec{A}$$

* $\omega = \omega_s + \omega_p$ $\Rightarrow$ measured from the abosulate coord. sys. (X, Y, Z)

ω_p $\Rightarrow$ measured from the relative coord. sys. (x, y, z) $\Rightarrow \Omega = \omega_p$

$\dot{\omega}_s = (\dot{\omega}_s)_{xyz} + \omega_p \times \omega_s$

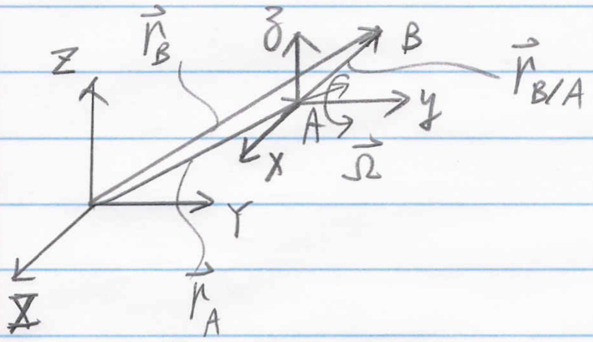
$\dot{\omega}_p = (\dot{\omega}_p)_{xyz} + \omega_p \times \omega_p$

$$\Rightarrow \boxed{\alpha = \dot{\omega} = \dot{\omega}_s + \dot{\omega}_p}$$

Relative-Motion Analysis Using Translating and Rotating Axes

* Position :

$$\boxed{\vec{r}_B = \vec{r}_A + \vec{r}_{B/A}}$$



* Velocity :

$$\boxed{\vec{v}_B = \vec{v}_A + \vec{\Omega} \times \vec{r}_{B/A} + (\vec{v}_{B/A})_{xyz}}$$

* Acceleration :

$$\boxed{\begin{aligned}\vec{a}_B = \vec{a}_A + \dot{\vec{\Omega}} \times \vec{r}_{B/A} + \vec{\Omega} \times (\vec{\Omega} \times \vec{r}_{B/A}) \\ + 2\vec{\Omega} \times (\vec{v}_{B/A})_{xyz} + (\vec{a}_{B/A})_{xyz}\end{aligned}}$$