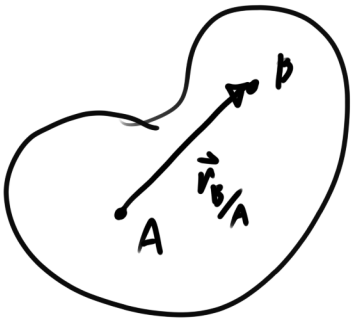
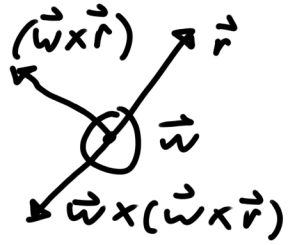
General Plane Motion: Acceleration



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

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



$$|\vec{r}| = r$$

$$|\vec{\omega} \times \vec{r}| = \omega r$$

$$|\vec{\omega} \times (\vec{\omega} \times \vec{r})| = \omega^2 r$$

$$\vec{\lambda} = \frac{\vec{r}}{r}$$

$$\vec{a}_B = \vec{a}_A + \underbrace{\vec{\alpha} \times \vec{r}_{B/A} - \omega^2 \vec{r}_{B/A}}_{\vec{a}_{B/A}}$$

$$\vec{\omega} \times (\vec{\omega} \times \vec{r}) = \omega^2 r \vec{\lambda}$$

$$= \omega^2 r \frac{\vec{r}}{r} = -\omega^2 \vec{r}$$

$$(\vec{a}_{B/A})_n = -\omega^2 \vec{r}_{B/A}$$

$$(\vec{a}_{B/A})_t = \vec{\alpha} \times \vec{r}_{B/A}$$