

## Linear to Angular Momentum

$$\vec{F} = m\vec{a}$$

$$\vec{F} = m \frac{d\vec{v}}{dt}$$

$$\vec{F} = \frac{d}{dt}(m\vec{v})$$

$$\vec{F} = \frac{d\vec{p}}{dt}$$

$$\vec{\tau} = I\vec{\alpha}$$

$$\vec{\tau} = I \frac{d\omega}{dt}$$

$$\vec{\tau} = \frac{d}{dt}(I\vec{\omega})$$

$$\vec{\tau} = \frac{d\vec{L}}{dt}$$

$$\vec{\tau} = \vec{r} \times \vec{F}$$

$$\frac{d\vec{L}}{dt} = \vec{r} \times \frac{d\vec{p}}{dt}$$

Want:

$$\frac{d}{dt}(\vec{L}) = \frac{d}{dt}(\vec{r} \times \vec{p})$$

Works because cross product only cares about  $r_{\perp}$

Important Equation

$$\vec{L} = \vec{r} \times \vec{p}$$