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

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