

$\text{FBD} = \text{KD} = \vec{r} \times \vec{F} = \vec{r} \times m\vec{a}$

$$\tau = \sum \vec{M} = \vec{r} \times \sum \vec{F} = \vec{r} \times m\vec{a} \Rightarrow I\alpha$$

$$\vec{r}_1 = r\hat{j} \quad \vec{r}_2 = -r\hat{j} \quad \sum M = -2Fr = I\alpha$$

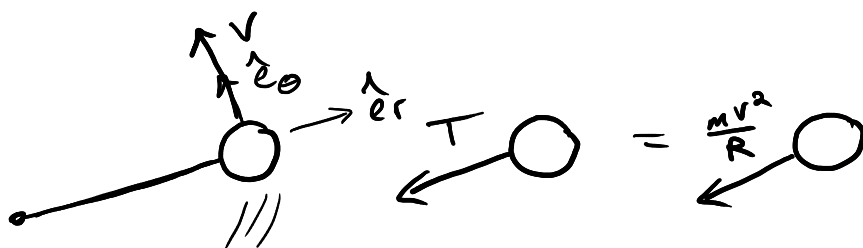
$$\hat{k} \times \hat{j} = \hat{i}$$

$$r\hat{j} \times F\hat{i} + -r\hat{j} \times -F\hat{i} = I\alpha$$

$$-2rF\hat{k} = I\alpha$$

$$F = \frac{I\alpha}{2r}$$

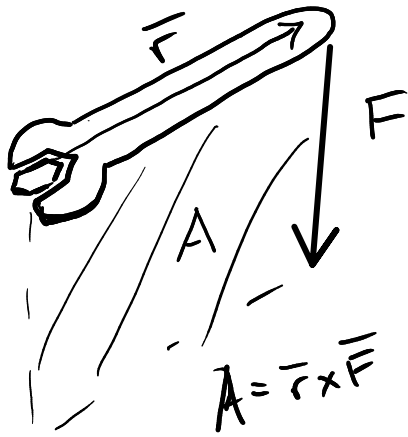
note:



$$\vec{r} \times \vec{T} = 0$$

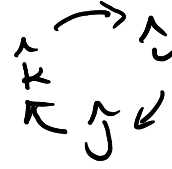
$$\vec{r} \times \frac{mv^2}{R} \hat{e}_r = 0$$

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



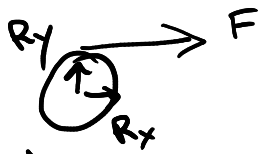
$$\vec{r} = 2\hat{i} + 1\hat{j} \text{ (m)}$$

$$\vec{F} = -4\hat{j} \text{ (N)}$$



$$\begin{aligned} \vec{r} \times \vec{F} &= (2\hat{i} + 1\hat{j}) \times (-4\hat{j}) \\ &= -8\hat{k} \text{ Nm} \end{aligned}$$

note  
realistic  
start  
needs  
pin constraints



$$= \bigcirc \uparrow I\alpha$$