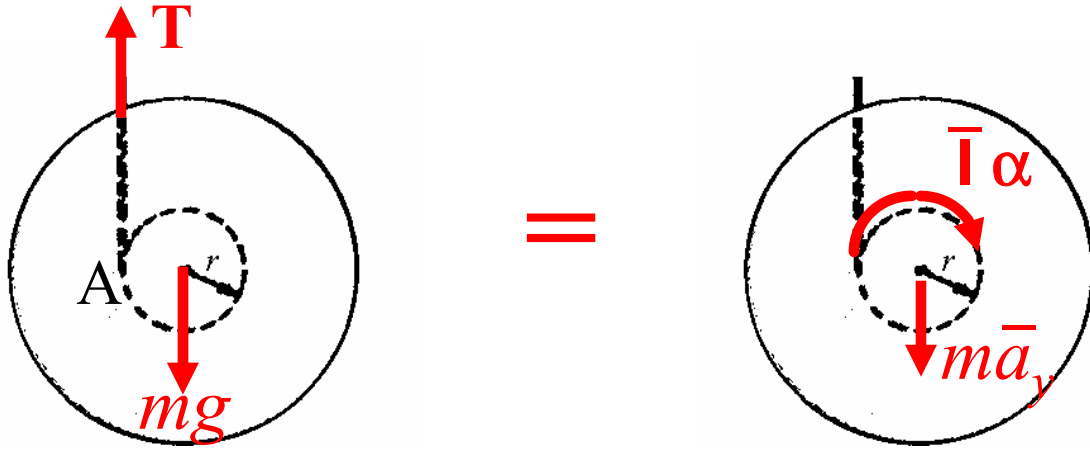


The end of a cord, which wraps around a yo-yo, moves upward with an acceleration g . Find (a) the angular acceleration of the yo-yo, and (b) the force required for this motion.



$$\rightarrow 0 = m \bar{a}_x$$

$$\uparrow T - mg = -m \bar{a}_y$$

$$A) \quad mg r = \bar{I} \alpha + r m \bar{a}_y$$

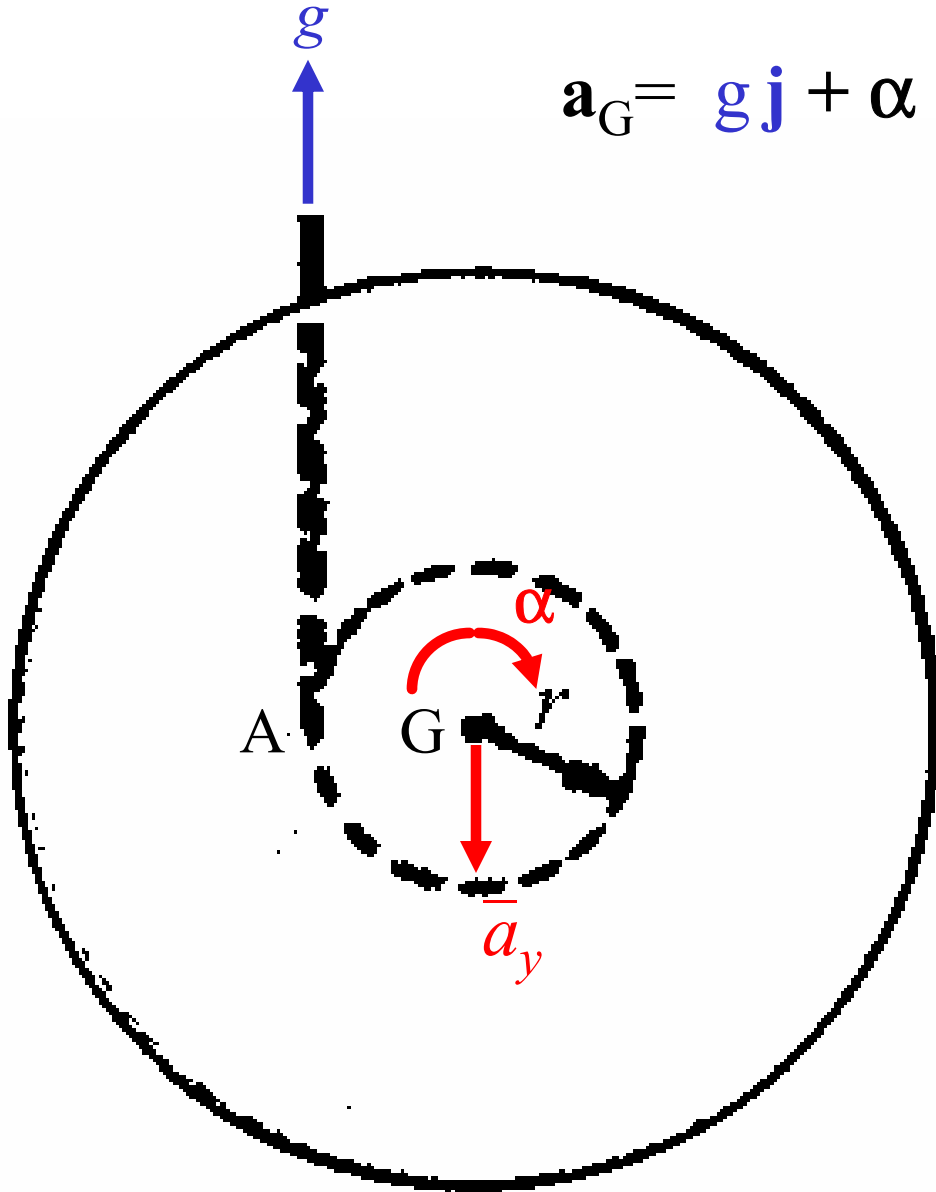
Kinematics:

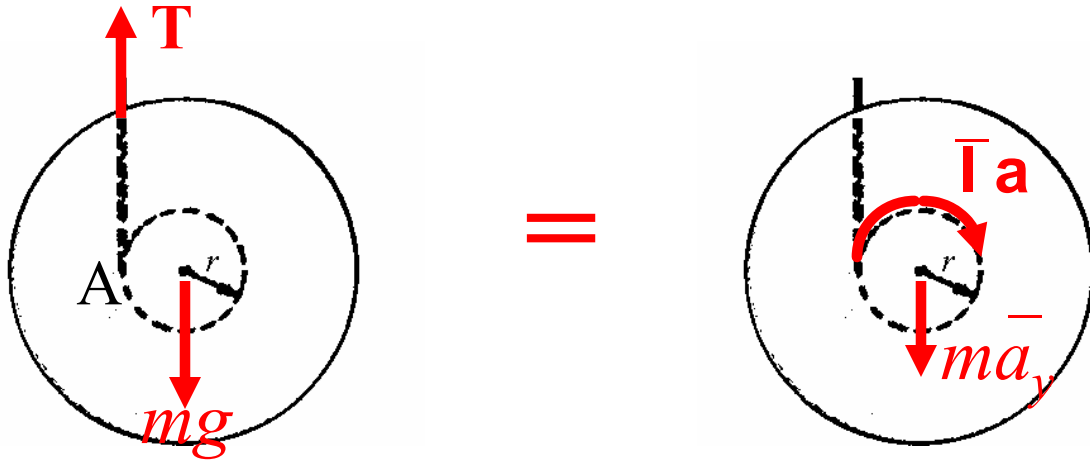
$$\mathbf{a}_G = \mathbf{a}_A + \alpha \mathbf{x} \mathbf{r}_{G/A} + \omega \mathbf{x} (\omega \mathbf{x} \mathbf{r}_{G/A})$$

$$\mathbf{a}_G = g \mathbf{j} + \alpha \mathbf{x} \mathbf{r}_{G/A} + \omega \mathbf{x} (\omega \mathbf{x} \mathbf{r}_{G/A})$$

$$\begin{aligned} -\bar{a}_y \mathbf{j} &= g \mathbf{j} + (-\alpha \mathbf{k}) \times r \mathbf{i} \\ &= g \mathbf{j} - \alpha r \mathbf{j} \end{aligned}$$

$$-\bar{a}_y = g - \alpha r$$





$$\rightarrow 0 = m \bar{a}_x$$

$$\uparrow T - mg = -m \bar{a}_y$$

$$A \curvearrowright mg r = \bar{I} \alpha + r m \bar{a}_y$$

$$-\bar{a}_y = g - \alpha r$$