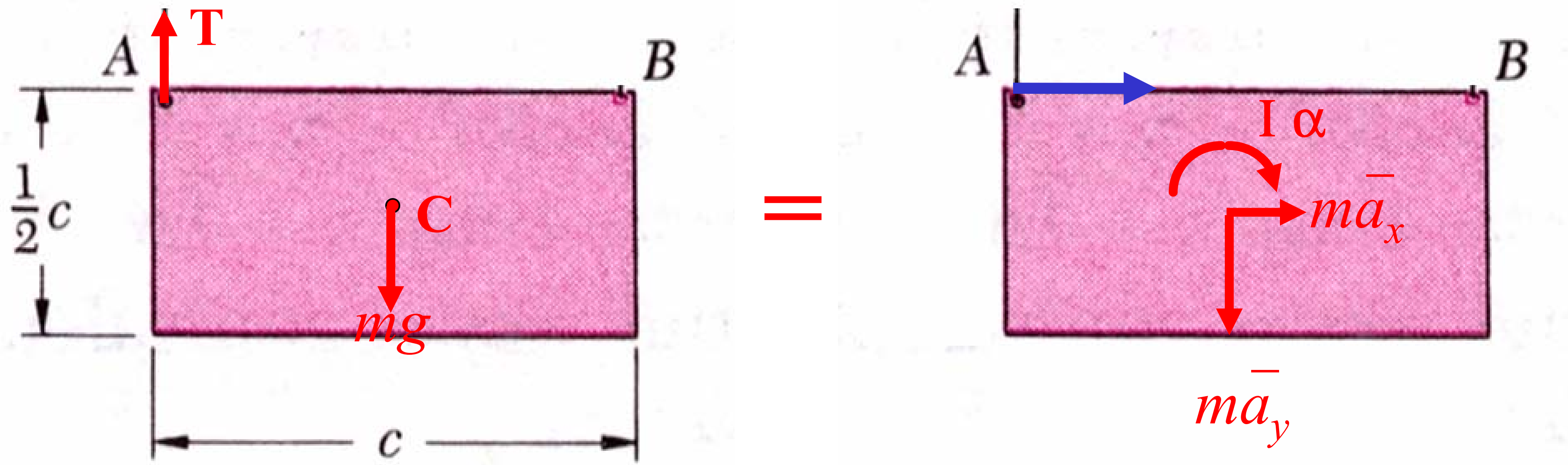
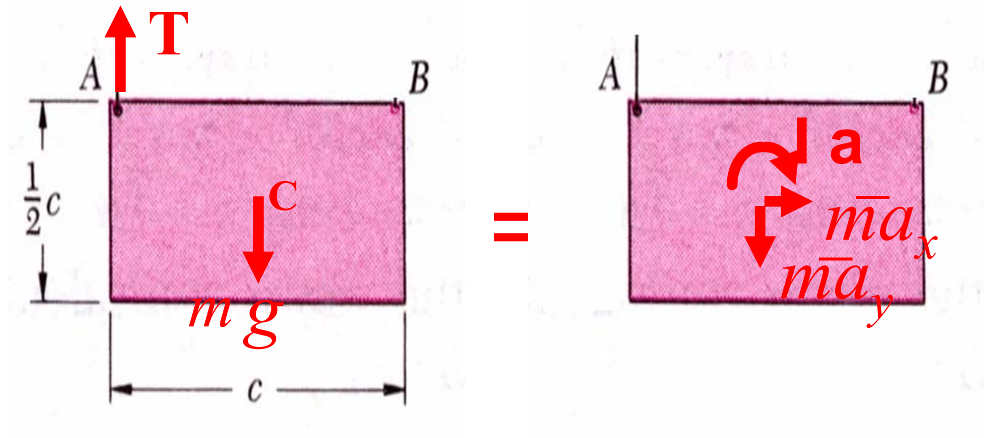
Kinetics: Constraint at A: $\mathbf{a}_A = a_A\,\mathbf{i}$



Kinematics: $\mathbf{a}_C = a_A\,\mathbf{i} + \alpha \times \mathbf{r}_{C/A} + \cancel{\omega} \times (\cancel{\omega} \times \mathbf{r}_{C/A})$

A uniform plate of mass m is suspended in each of the ways shown. Determine immediately after the connection at B has been released (a) the angular acceleration of the plate, (b) the acceleration of its mass center.

Kinetics:



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

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

$$A \circlearrowright \quad mg\left(\frac{c}{2}\right) = \bar{I}\,\alpha + \left(\frac{c}{2}\right) m\,\bar{a}_y$$

Kinematics: $\mathbf{a}_C = a_A\,\mathbf{i} + \alpha \times \mathbf{r}_{C/A} + \cancel{\omega} \times (\cancel{\omega} \times \mathbf{r}_{C/A})$

$$\bar{a}_x\,\mathbf{i} - \bar{a}_y\,\mathbf{j} = a_A\,\mathbf{i} + (-\alpha\,\mathbf{k}) \times (c/2\,\mathbf{i} - c/4\,\mathbf{j})$$

$$= a_A\,\mathbf{i} - \alpha\, c/2\,\mathbf{j} - \alpha\, c/4\,\mathbf{i}$$

$$\boxed{\bar{a}_x = 0} \qquad \boxed{a_A = c\,(\alpha/4)} \qquad \boxed{\bar{a}_y = c\,(\alpha/2)}$$

Acceleration at point A is different from the acceleration at any other points in the rigid body due to angular acceleration.