$$m_t\vec{v}_{t1} + m_b\vec{v}_{b1} \quad = \quad m_t\vec{v}_{t2} + m_b\vec{v}_{b2}$$

$$\vec{v}_{b2} - \vec{v}_{t2} \quad = \quad e(\vec{v}_{b1} - \vec{v}_{t1})$$

$$\text{acceleration} \quad = \quad \frac{\text{Force}}{\text{mass}}$$

$$\text{angular acceleration} \quad = \quad \frac{\text{Torque}}{\text{moment of inertia}}$$