Welcome back ... ask questions

211 Nov. 30

- Record
- HW
- Read chapter 12, 13 & 14
- Final 8-11 Friday Dec 11 ⇒ Online
- Quiz ??
- Lab ⇒ speed of sound ⇒ online

Today: Rotational motion: moment of inertia, torque, rotational dynamics, gravitational torque, static equilibrium, stability, rolling motion, angular mom. & conservation of angular mom., Intro to Gravity, Kepler ... Newtons law of Gravity

moment of inertia - $I = \sum r_i^2 m_i$

$I = \int r^2 dm$

↳ distance from axis of rotation

rotational energy K_{rot}

$K_{rot} = \frac{1}{2} I \omega^2$

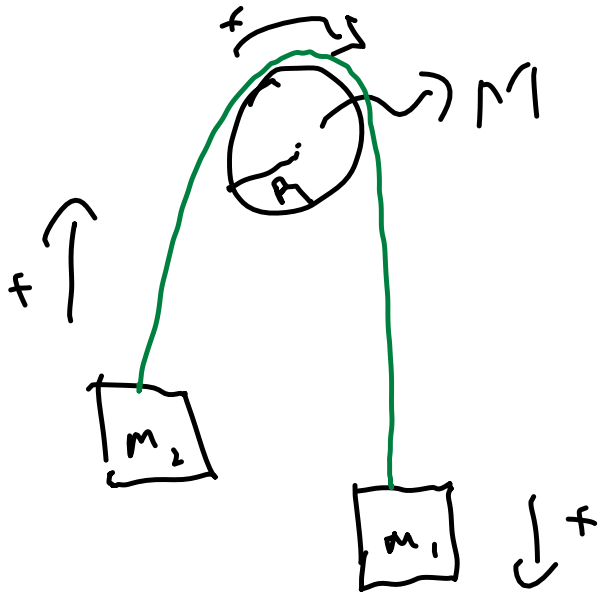
↳ angular velocity

like $K = \frac{1}{2} m v^2$

what changes rotational motion?

Torque $\Rightarrow \tau = rF \sin\phi$

Atwood machine with a massive pulley



$\sum F = ma$

$\sum \tau = I\alpha$

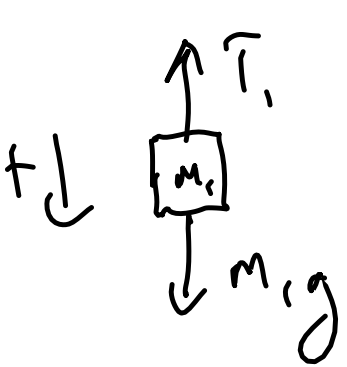
m_1

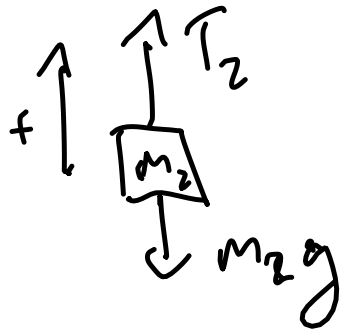
m_1: $m_1 g - T_1 = m_1 a$

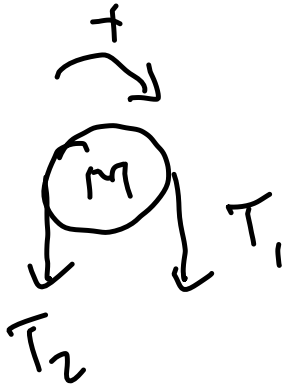
m_2: $T_2 - m_2 g = m_2 a$

M: $T_1 R - T_2 R = I\alpha$

$I = \frac{1}{2} M R^2$ $\quad \alpha = \frac{a}{R}$







M: $T_1 - T_2 = \frac{1}{2} M a$

$\Rightarrow m_1 g - m_1 a - m_2 g - m_2 a = \frac{1}{2} M a$

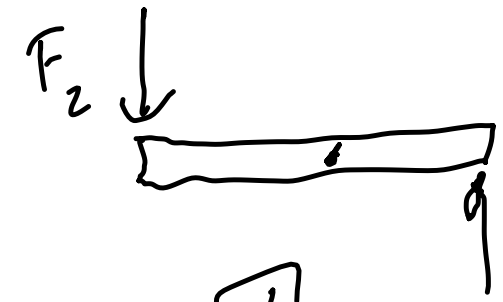
$$a = \frac{m_1 - m_2}{m_1 + m_2 + \frac{1}{2}M} g$$

Static equilibrium

$\sum \vec{F} = 0$

$\sum \tau = 0$

↳ around any axis



$\sum F = 0$ but $\sum \tau \neq 0$