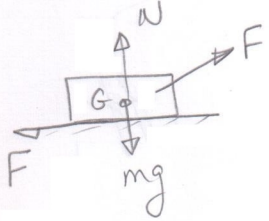


Kinetics of a rigid body

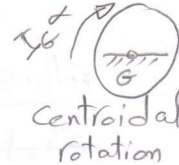
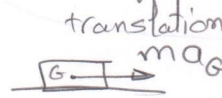
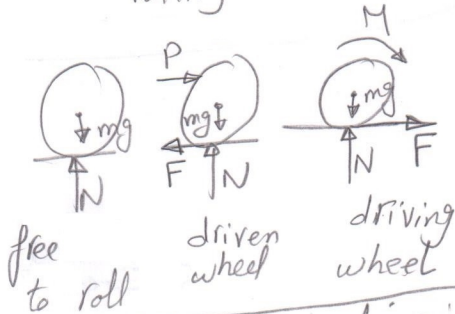
ext. forces $\begin{cases} \text{weight at } G \\ \text{reactions} \\ \text{other forces} \end{cases}$

eff. forces

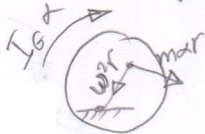
translation



rolling



rolling



$$\begin{aligned} \sum F_x)_{\text{ext.}} &= \sum F_x)_{\text{eff.}} \\ \sum F_y)_{\text{ext.}} &= \sum F_y)_{\text{eff.}} \\ \sum M_A)_{\text{ext.}} &= \sum M_A)_{\text{eff.}} \end{aligned}$$

* rolling with slipping $F = \mu_k N$
 $F \leq \mu_s N$ if $a_G = ar$
 ~ w/o ~

* $I_G = \text{moment of Inertia} = mK^2$
 as $K = \text{radius of gyration}$

* rolling on Grd
 No N & Friction & $a_G = ar$

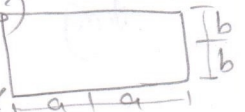


$$I_G = \frac{1}{3} m a^2$$

$$I_G = \frac{1}{3} m (a^2 + b^2)$$

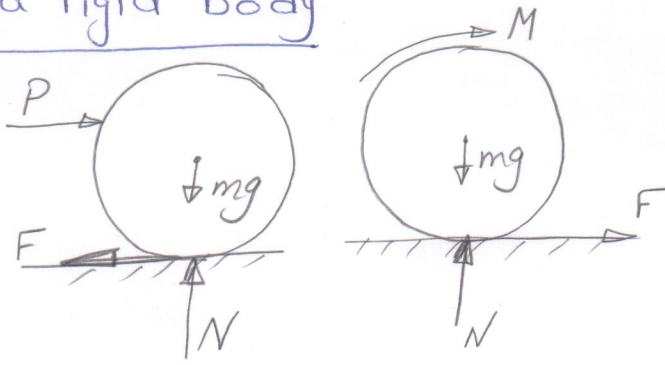
disk or cylinder

$$I_G = \frac{1}{2} m r^2$$



Kinetics of a rigid body

C-Rolling



لوالعجل
تتحرك تحت
تأثير Coupling

driven wheel

driving wheel

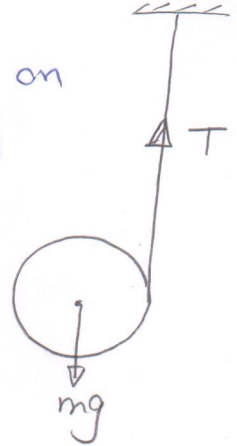
rolling w/o slipping $F \leq \mu_s N$

rolling with slipping $F = \mu_k N$

rolling on
the cord

لا يوجد رد فعل الجبل على الكرة

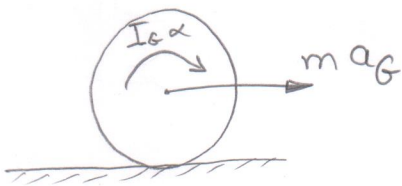
Friction &



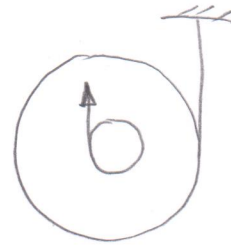
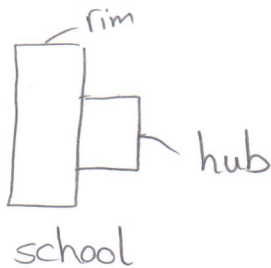
* rolling on a cord or
rolling w/o slipping

for driven or driving

$$a_G = \alpha r$$



EX. Pg 386



EX. Pg 387

