Why don't racing motorcycles fall over more often?

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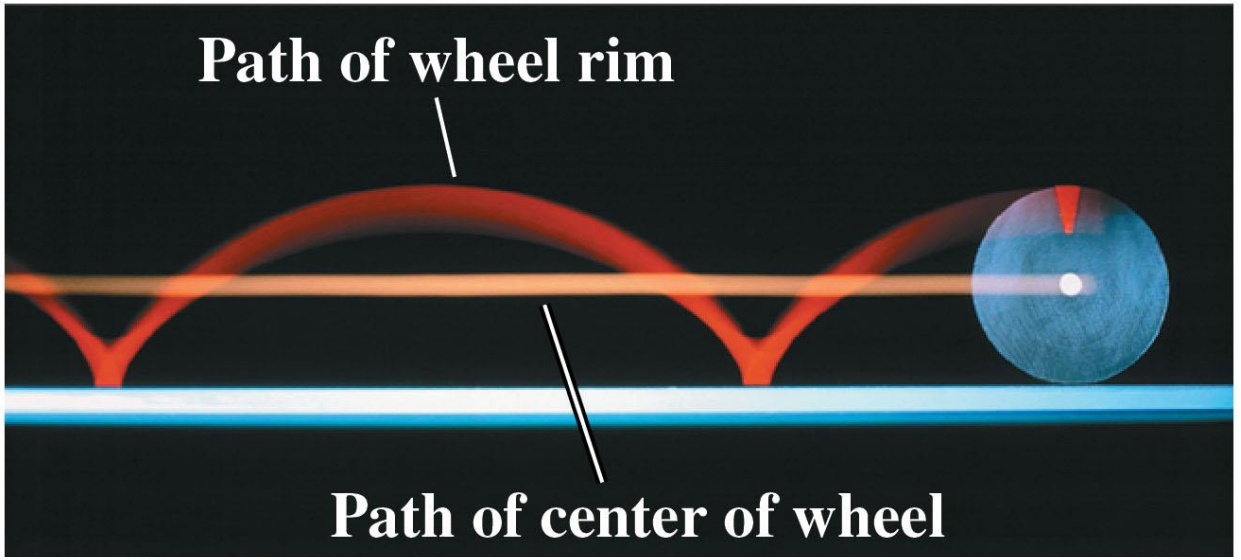
Chapter 12 – Rotation of a Rigid Body

- Centre of mass and moment of inertia
- Torque and cross product
- Rolling motion and rotational energy
- Angular momentum



$v_{cm}\,\Delta t = \omega R\,\Delta t = 2\pi R$

$\omega\,\Delta t = 2\pi$

Period T → $\omega = \dfrac{2\pi}{T}$

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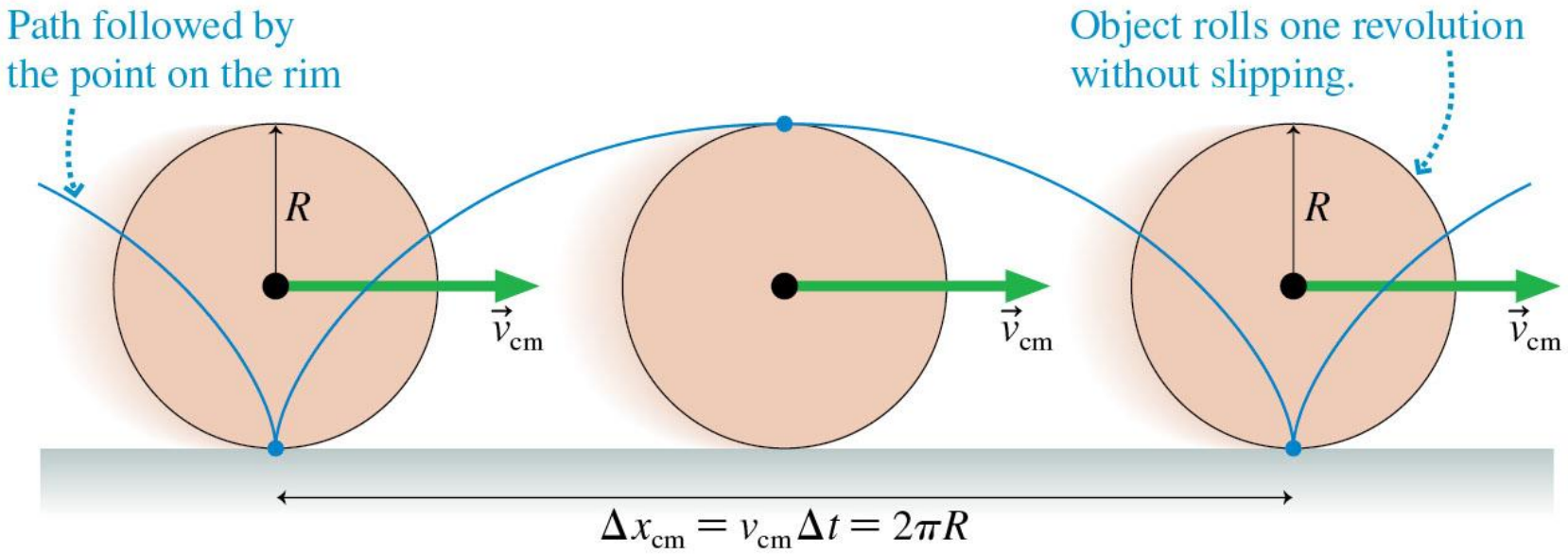
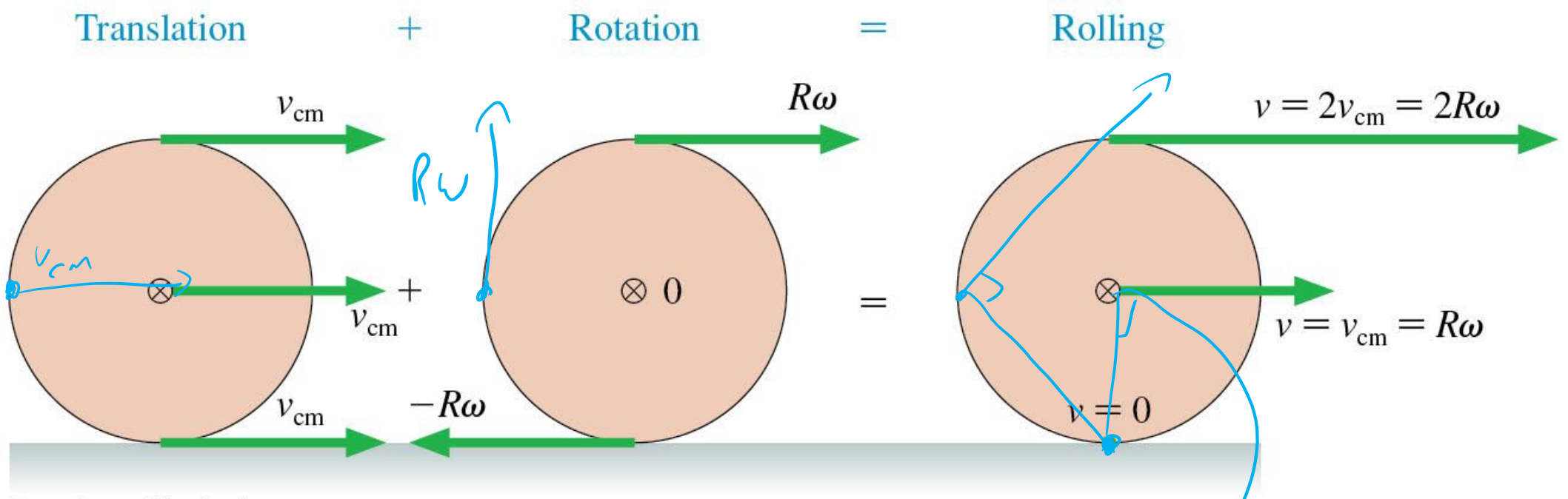
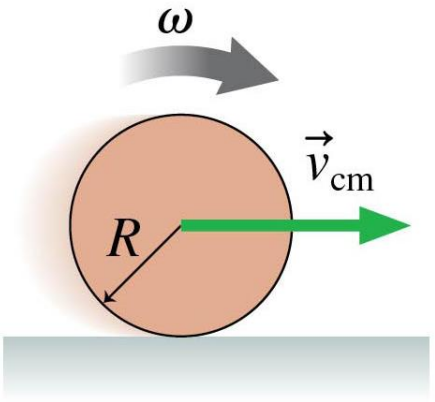




For an object that rolls without slipping

$$v_{cm} = R\omega$$

$$K = K_{rot} + K_{cm}$$

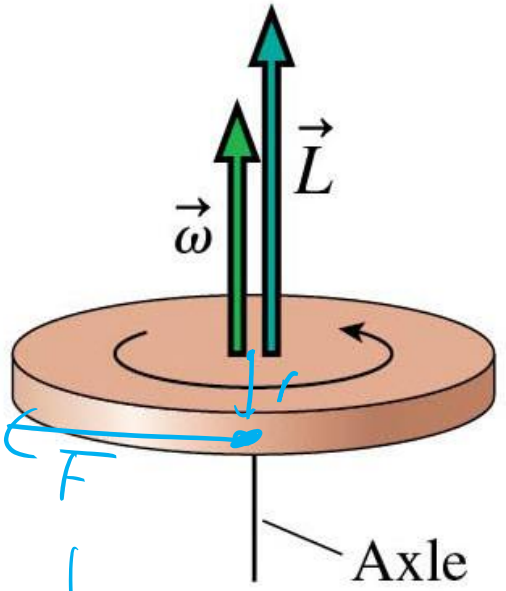


what if $R\omega > v_{cm}$

Angular velocity $\vec{\omega}$ points along the rotation axis in the direction of the right-hand rule.

For a rigid body rotating about a fixed axle, the angular momentum is $\vec{L} = I\vec{\omega}$.

Newton's second law is $\dfrac{d\vec{L}}{dt} = \vec{\tau}_{\text{net}}$.



$\vec{p} = m\vec{v}$

$\vec{p} \leftrightarrow \vec{L}$

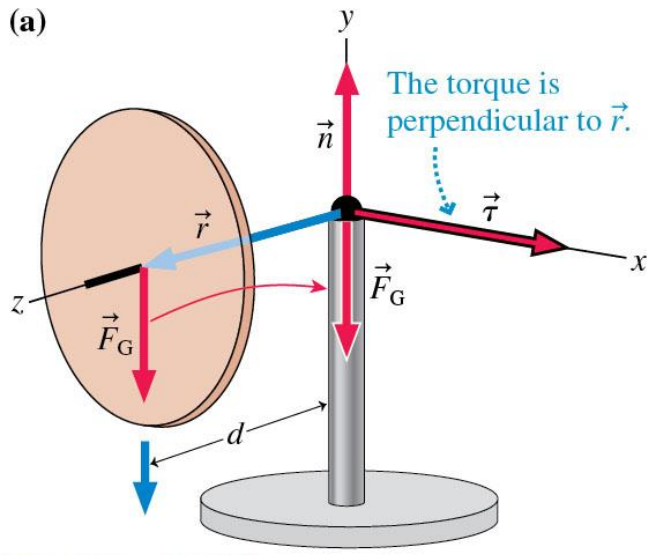
$m \leftrightarrow I$

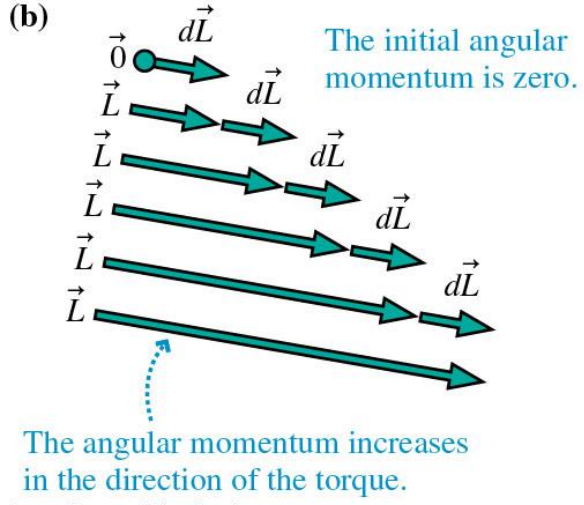
$\vec{v} \leftrightarrow \vec{\omega}$

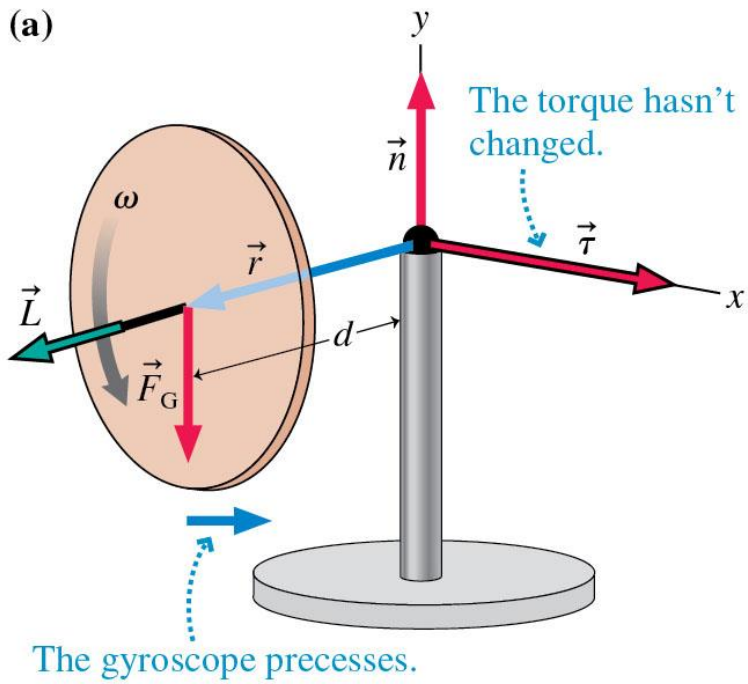
$\dfrac{d\vec{p}}{dt} = \vec{F}$

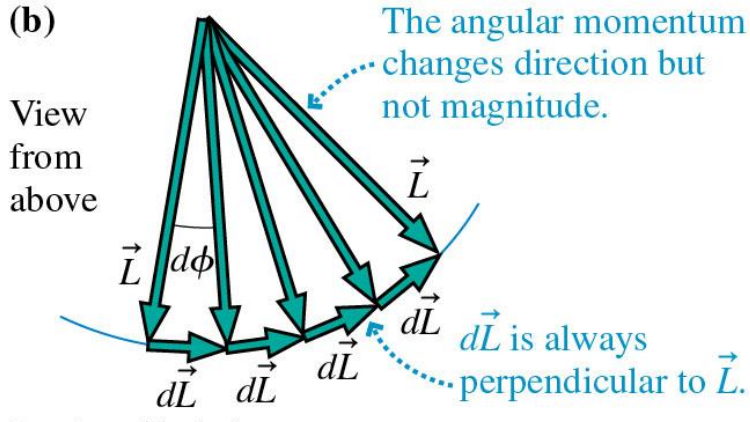
$\vec{\tau}$

$\dfrac{d\vec{L}}{dt}$

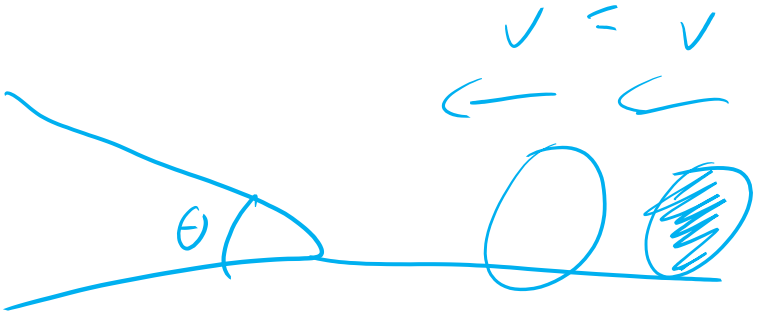








Team Up Questions



$K_{rot} > K_{rot}$

$K \rightarrow 0$

$U_g \rightarrow$ increased

Motorcycle physics