

Workbook



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Questions

1) Man Riding a Motorbike.

A motorcyclist begins her motion from rest.

Her distance from the starting point is given by $r = ct$, where c is a constant.

The motorcyclist also has a constant angular velocity of ω .

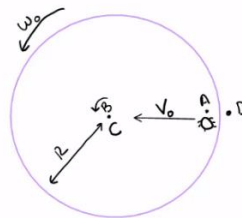
Find the maximal distance the motorcyclist will reach when given the coefficient of static friction μ_s .

2) Carrousel.

A ladybird moves along a carrousel which has constant angular velocity, ω_0 .

The carrousel has radius R . The ladybird moves from one end of the carrousel to the center at a constant velocity v_0 , relative to the carrousel.

- a. Find the position of the ladybird, in Cartesian coordinates and in polar coordinates, relative to the following observers:
 - i. Observer A – standing on the carrousel at the ladybirds starting point.
 - ii. Observer B – standing at the center of the carrousel.
 - iii. Observer C – standing at the center of the carrousel but not rotating with it.
 - iv. Observer D – standing at the edge of the carrousel but not rotating with it.
- b. Find the velocity and acceleration of the ladybird relative to the different observers.



Answer Key

1)
$$r_{\max} = \sqrt{(\mu_s g)^2 - (2_c \omega_0)^2} \left(\frac{1}{\omega_0} \right)$$

2) Refer to the video.