

Physics 101Rec

Quiz # 6

Chapter 11

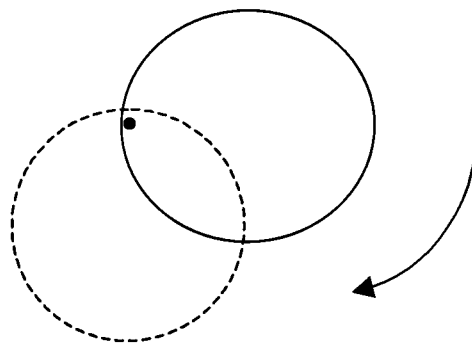
Instructor: Dr. A. Mekki

Name: Key Id: \_\_\_\_\_ Sect: \_\_\_\_\_

A uniform disk of radius  $R = 2$  m and mass  $M = 1.5$  kg is free to rotate on a frictionless pin in a vertical plane as shown in the figure. The rod is released from rest in the horizontal position.

- (i) What is the angular speed of the disk when it is in the vertical position?  
 (ii) What is the linear speed of the lowest point on the disk when it is in this vertical position.

Given:  $I_{CM} = \frac{1}{2} MR^2$



$$\Delta K + \Delta U_g = 0$$

$$\frac{1}{2} I \omega^2 - mgR = 0$$

$$\omega = \sqrt{\frac{2mgR}{I}}$$

$$I = \frac{1}{2} MR^2 + mR^2$$

$$= \frac{3}{2} mR^2$$

$$\omega = \sqrt{\frac{2mgR}{\frac{3}{2}mR^2}} = \sqrt{\frac{4g}{3R}} = 2.5 \text{ rad/s}$$

$$v_{top} = \omega(2R) = \sqrt{\frac{16 \times 4g}{3}} = 10.4 \text{ m/s}$$