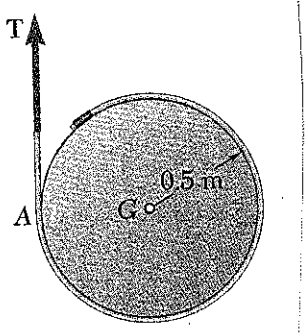
1. A cord is wrapped around a homogeneous disk of radius r = 0.5 m and has a mass of m = 15 kg. If the cord is pulled upward with a force of T = 180 N, determine
   a) the acceleration of the center of the disk , a_C and
   b) the angular acceleration of the disk, α_C.

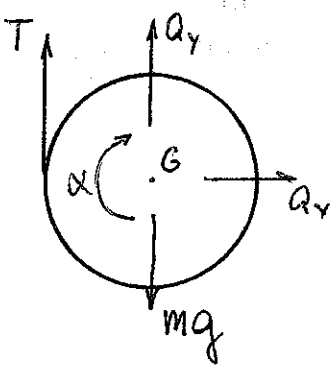


$+\uparrow \sum F_y = T - mg = ma_y$

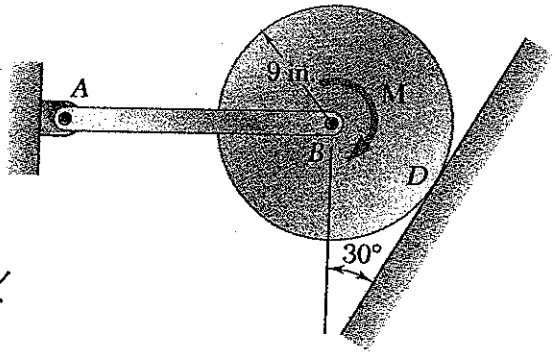
$a_y = \dfrac{180 - 15(9.81)}{15} = 2.19 \text{ m/s}^2 \uparrow$

$\circlearrowleft \sum M_G = Tr = I\alpha$

$\alpha_c = \dfrac{180(.5)}{\frac{1}{2}(15)(.5)^2} = 48 \text{ rad/sec} \circlearrowright$

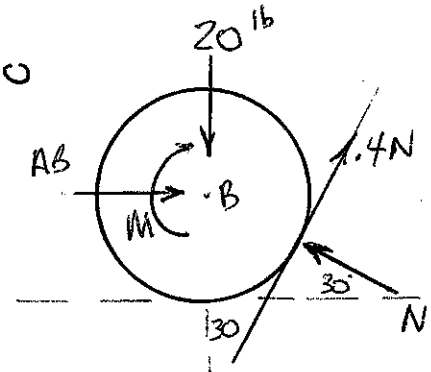


2. A 20-lb uniform disk is placed in contact with an inclined surface as shown. A constant moment M = 7.5 ft lb is then applied. The kinetic coefficient of friction between the disk and incline $\mu_k = 0.4$. The weight of the link AB is negligible. Determine a) the angular acceleration of the disk and b) the force in the link AB.



$$I_B = \frac{1}{2}\left(\frac{20}{32.2}\right)\left(\frac{9}{12}\right)^2 = .1747 \text{ ft lb s}^2$$

$$\left(\sum M_B = 7.5 - (.4)N\left(\frac{9}{12}\right) = .1747\alpha\right)$$



$$+\uparrow \sum F_Y = .4N\cos 30^\circ + N\cos 60^\circ - 20 = 0$$

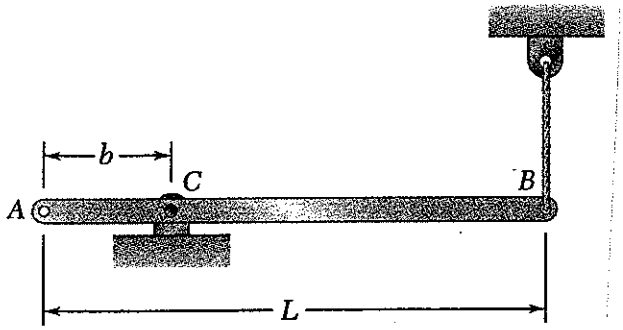
$$N = 23.63 \text{ lb} \leftarrow$$

$$\alpha = 2.354 \text{ r/s}^2 \text{)}$$

$$+\rightarrow \sum F_x = AB - .866N + .4N(.5) = 0$$

$$AB = 15.737 \text{ lb} \rightarrow$$

3. A uniform rod of length L = 10 meters with a mass of 50 kg is supported by a cable at B and a pin at C. The length b = 2 meters. The cable at B suddenly breaks. Determine at this instant a) the acceleration of the end at B, and b) the reaction (total force in Newtons) on the pin at C.

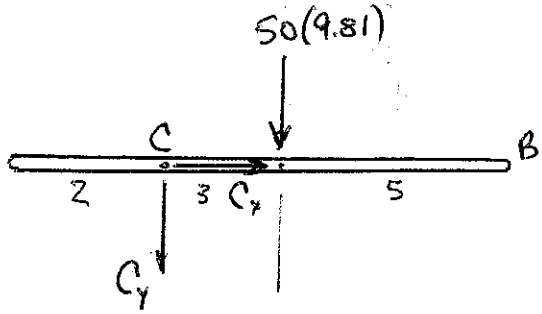


$$I_c = \frac{1}{12}(50)(10)^2 + 50(3)^2 = 866.67 \text{ Kg m}^2$$

$$\sum M_c = 50(9.81)3 = I\alpha_c$$

$$\alpha_c = 1.698 \text{ r/s}^2 \text{)}$$

$$a_b = r\alpha = 8(1.698) = 13.58 \text{ m/sec}^2 \downarrow$$



$$+\downarrow \sum F_y = C_y + 50(9.81) = 50\,a_{G_y} = 50(3)(1.698)$$

$$C_y = 235.8 \text{ N} \uparrow$$

$$\pm \sum F_x = C_x = 0$$