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

\[ \sum F_y = T - mg = ma_y \]

\[ a_y = \frac{180 - 15(9.81)}{15} = 2.19\,\text{m/s}^2 \uparrow \]

\[ \sum M_c = Tr = I\alpha \]

\[ \alpha_c = \frac{180(0.5)}{\frac{1}{2}(15)(0.5)}^2 = 48\,\text{rad/s}^2 \]

[Diagram showing forces and moments]
2. A 20-lb uniform disk is placed in contact with an inclined surface as shown. A constant moment $M = 7.5 \text{ ft lb}$ 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.

\[
I_B = \frac{1}{2} \left( \frac{2\alpha}{32.2} \right) \left( \frac{9}{12} \right)^2 = 1.747 \text{ ft lb s}^2
\]

\[
\sum M_B = 7.5 - (0.4)N \left( \frac{9}{12} \right) = 1.747 \alpha
\]

\[
\sum F_Y = 0.4N \cos 30^\circ + N \cos 60^\circ - 20 = 0
\]

\[N = 23.63 \text{ lb}
\]

\[\alpha = 7.354 \text{ r/s}^2
\]

\[
\sum F_X = AB - 0.866N + 0.4N(\sin 30) = 0
\]

\[AB = 15.737 \text{ lb}
\]
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.

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

\[ \sum M_c = 50(9.81)(3) = I \alpha_c \]

\[ \alpha_c = 1.698 \text{ rad s}^{-2} \]

\[ a_b = r \alpha = 8(1.698) = 13.58 \text{ m/s}^2 \downarrow \]

\[ + \sum F_y = C_y + 50(9.81) = 50 a_b \gamma = 50(3)(1.698) \]

\[ C_y = 235.8 \text{ N} \uparrow \]

\[ \sum F_x = C_x = 0 \]