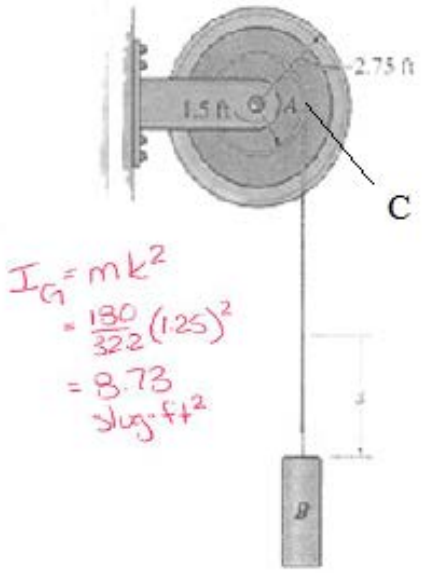
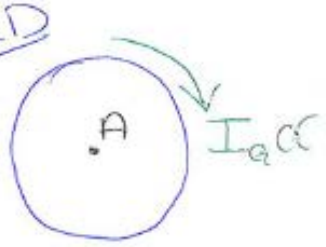
Problem 8. The cord is wrapped around the inner core of the spool. If a 5-lb block *B* is suspended and released from rest, determine the acceleration of block *B* and the tension in the cord. The spool has a weight of 180 lb and the radius of gyration about the axle *A* is k_A = 1.25 ft.



FBD

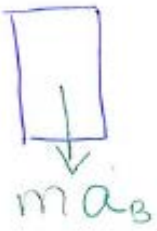
KD



$I_G = mk^2$

$= \frac{180}{32.2}(1.25)^2$

$= 8.73$ slug·ft²



Spool:

$\curvearrowleft \sum M_A = I_G\alpha \Rightarrow 1.5T = 8.73\alpha$

Block:

$\uparrow \sum F_y = ma_{Gy} \Rightarrow T - 5 = -\frac{5}{32.2}a_B$

$T - 5 = -.233\alpha$

From kinematics:

$a_B = a_C = \alpha r = 1.5\alpha$

by substitution:

$1.5(5 - .233\alpha) = 8.73\alpha$

$\alpha = .826 \text{ rps}^2 \curvearrowright$

$T = 4.81 \text{ lb}$

$a_B = 1.23 \text{ ft/s}^2 \downarrow$

Answer: T = 4.81 lb and a_B = 1.23 ft/s²↓