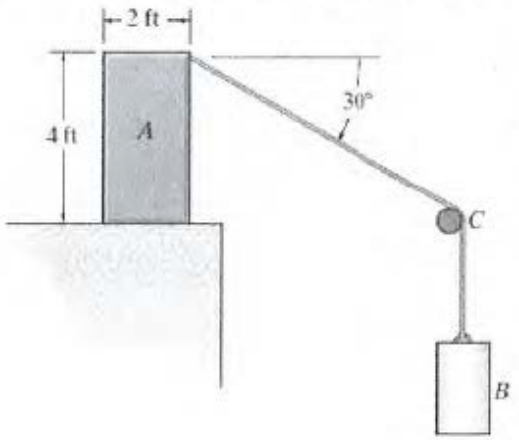
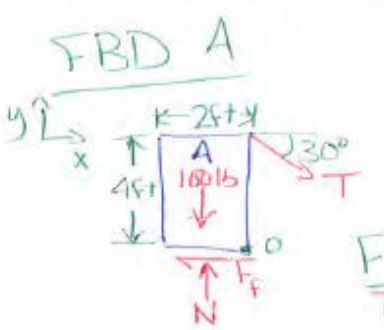
Problem 1 – Friction IV

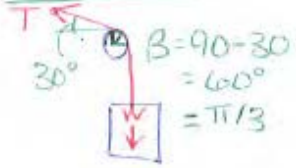
Block *A* has a weight of 100 lb and rests on a surface for which $\mu_s = 0.25$. If the coefficient of static friction between the cord and the fixed peg at *C* is $\mu_s = 0.3$, determine the greatest weight of the suspended cylinder *B* without causing motion.



FBD A



FBD CB



from FBD CB

$T_2 = T_1 e^{\mu\beta}$

$W = Te^{[(.3)(\pi/3)]}$

$T = .73W$

from FBD A

check sliding $\therefore F_f = \mu N = .25N$

$\rightarrow \Sigma F_x = 0 = T\cos 30 - F_f$

$= (.73W)\cos 30 - .25N$

$= .632W - .25(100 + .365W)$

$\uparrow \Sigma F_y = 0 = N - 100 - T\sin 30°$

$= N - 100 - (.73W)\sin 30°$

$N = 100 + .365W$

$W = 46.2$ lb

from FBD A

check tipping $\therefore N @ O$

$\circlearrowleft \Sigma M_o = 0 = (T\cos 30)(4) - 100(1)$

$= (.73W\cos 30)(4) - 100$

$2.529W = 100$

$W = 39.5$ lb

$39.5 < 46.2$ tips first

max $W = 39.5$ lb