Friction III – Problem 1

A cylinder having a mass of 250 kg is to be supported by the cord which wraps over the pipe. Let $\mu_s = 0.2$

a) Determine the smallest vertical force, F, needed to support the load if the cord passes over the pipe two times as shown.

b) Determine the largest vertical force, F, needed to support the load if the cord passes over the pipe two times as shown.

a) smallest → cylinder falls

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

$T_1 = F$

$T_2 = (250)(9.81)$

$\mu = 0.2$

$\beta = 3\pi$

$\frac{(250)(9.81)}{e^{[(.2)(3\pi)]}} = T$

$F = 372\,N$

b) largest → cylinder rises

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

$T_1 = (250)(9.81)$

$T_2 = F$

$\mu = 0.2$

$\beta = 3\pi$

$F = [(250)(9.81)]\, e^{[(.2)(3\pi)]}$

$F = 16.2\,kN$