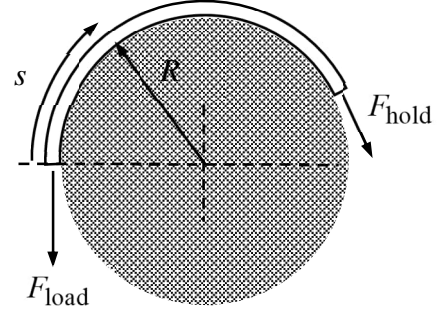Name_____ Student number_____

Assignment 5 (4p)

Derive the range of the hold force for a rope of length L around a bollard so that equilibrium is possible. Assume that the rope is inextensible in the direction of the mid-curve and flexible with respect to bending ($Q_n = M_b = 0$). Consider the fully developed Coulomb friction when the load is about to move up or down. Start with the equilibrium equations of beam in (s, n, b) – system. *Hint*: External force b_n is the unknown of the problem and $b_s = \pm \mu b_n$ is opposite to the pending motion (μ is the coefficient of friction).

Answer $\quad \exp(-\mu \dfrac{L}{R}) \leq \dfrac{F_{\text{hold}}}{F_{\text{load}}} \leq \exp(\mu \dfrac{L}{R})$