J05M.1 - Rope Around a Cylinder

Problem

A long rope is wound around a cylinder of radius r so that a length, l, of the rope is in contact with the cylinder. The coefficient of static friction between te rope and the cylinder is μ_s. A force F is exerted on one end of the rope. For a given F, r, l and μ_s, what force f must be applied to avoid the rope slipping? Explain why a small child can hold a large ocean liner in place using a device like this.