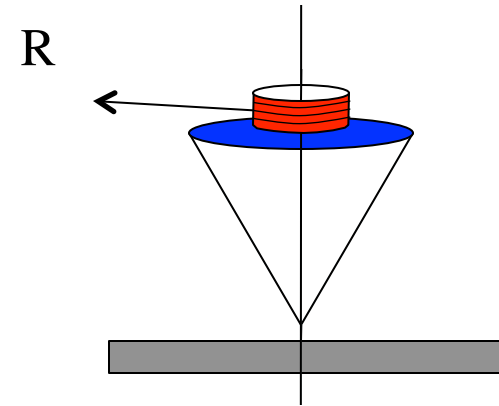## Problem 8.49

A top has moment of inertia of $4.0\text{x}10^{-4} \text{ kg} \bullet \text{m}^2$ about its central axis, and is initially at rest. A string is pulled producing constant force of 5.57 nts in the string. If there is no slippage, what will the top's angular speed after .8 meters of string have been pulled off.

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This is a conservation of energy problem:

$$\sum KE_1 + \sum U_1 + \sum W_{ext} = \sum KE_2 + \sum U_2$$

$$0 \quad + \quad 0 \quad + \vec{F} \bullet \vec{d} = \frac{1}{2} \quad I_{spool} \quad \omega^2 + \quad 0$$

$$\Rightarrow \quad (5.57 \text{ N})(.8 \text{ m}) = \frac{1}{2}\left(4\text{x}10^{-4} \text{ kg} \bullet \text{m}^2\right)\omega^2$$

$$\Rightarrow \qquad \omega = 149 \text{ rad/s}$$

1.)