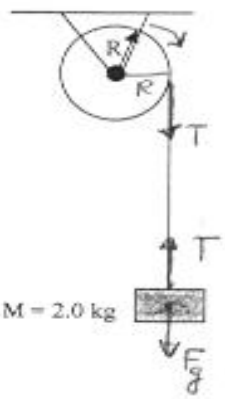
Physics 101-Rec
Quiz # 10

Instructor: Dr. Mekki

Name: Key Id#: Sect.#:

The pulley has a mass m = 0.50 kg and a radius R = 10 cm.
$I_{disk} = \frac{1}{2} mR^2$.
(a) What is the linear acceleration of the block of mass M = 2.0 kg?



Newton 2nd law for the pulley

$$TR = I\alpha$$

$$\alpha = \frac{a}{R}$$

$$\Rightarrow T = I\frac{a}{R^2} \quad \text{— (1)}$$

Newton 2nd law for the block

$$Mg - T = Ma \quad \text{— (2)}$$

$$Mg - I\frac{a}{R^2} = Ma \Rightarrow a\left(M + \frac{I}{R^2}\right) = Mg$$

$$\Rightarrow a = \frac{Mg}{M + \frac{1}{2}m} = \frac{2 \times 9.8}{2 + \frac{0.5}{2}} = \boxed{8.7\ m/s^2}$$

(b) What is the tension in the string?

$$T = I\frac{a}{R^2} = \frac{1}{2}mR^2\frac{a}{R^2} = \frac{1}{2}ma$$

$$= \frac{1}{2} \times 0.5 \times 8.7 = \boxed{2.18\ N}$$