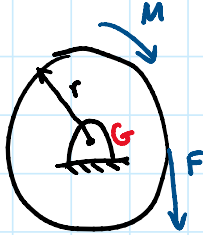


**Beginner** Principle of Impulse and Momentum

Inspiration: Hibbeler pg. 526



A 10 kg disk with radius  $r = 0.3\text{m}$  is subjected to a moment of  $5\text{ N}\cdot\text{m}$  and a force of  $10\text{ N}$  which is applied by a cord wrapped around the disk. Determine the angular velocity of the disk after 3 seconds if the disk starts at rest. Find the reaction forces in the pin.

$$I_G = \frac{1}{2} m r^2 = \frac{1}{2} (10) (0.3^2) = 0.45$$

$$m v_{Gx1} + \sum \int_{t_1}^{t_2} F_x dt = m v_{Gx2}$$

$$0 + A_x(3) = 0$$

$$A_x = 0$$

$$m v_{Gy1} + \sum \int_{t_1}^{t_2} F_y dt = m v_{Gy2}$$

$$0 + A_y(3) - 10(9.81)(3) - 10(3) = 0$$

$$A_y = 108.1\text{ N}$$

$$I_G \omega_1 + \sum \int_{t_1}^{t_2} M_G dt = I_G \omega_2$$

$$0 + 5(3) + (10)(0.3)(3) = 0.45 \omega_2$$

$$\omega_2 = 53.33\text{ rad/s}$$