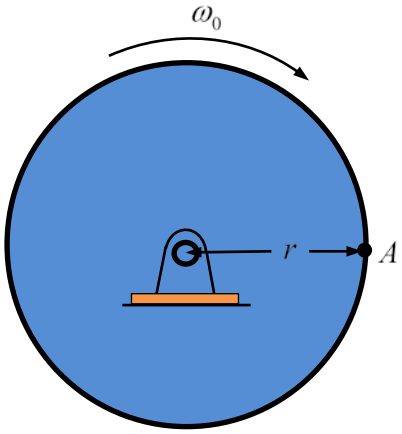
3-8. The angular velocity of a disk increases uniformly from $\omega_0 = 5$ rad/s to $\omega = 20$ rad/s in 10 s. If the radius of the disk is normally distributed $r \sim N(0.5, 0.01^2)$ m, determine the distance point *A* travels during the time period.



$$\omega = \omega_0 + \alpha t$$

$$\alpha = \frac{\omega - \omega_0}{t}$$

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$

$$\theta = \frac{\omega^2 - \omega_0^2}{2\alpha} = \frac{(\omega + \omega_0)t}{2}$$

$$s = \theta r = \frac{(\omega + \omega_0)tr}{2}$$

$$\mu_s = \frac{(\omega + \omega_0)t\mu_r}{2} = \frac{(5 + 20)(10)(0.5)}{2} = 62.5 \text{ m}$$

$$\sigma_s = \frac{(\omega + \omega_0)t\sigma_r}{2} = \frac{(5 + 20)(10)(0.01)}{2} = 1.25 \text{ m}$$

Therefore, $s \sim N(62.5, 1.25^2)$ m. **Ans.**