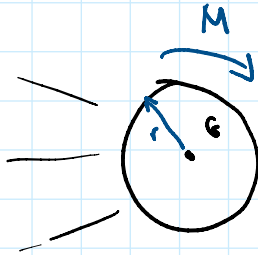20-R-WE-DK-4   Beginner   Work of a Couple Moment
  Inspiration: None

M

A frisbee is thrown such that its final angular velocity is **omega = 9 rad/s** after being in flight for **t = 3s**. As it flies, the wind applies a constant moment, causing the frisbee to rotate faster. If the frisbee was initially at rest, determine the moment of the wind and the work done by said moment. Assume the frisbee can be modelled as a disk with mass **m = 0.175 kg** and that it rotates about its center of gravity G. The frisbee has a radius **r = 0.14 m**.

$\omega = \omega_0 + \alpha t$ $9 = \alpha(3)$ $\alpha = 3$
$\omega^2 = \omega_0^2 + 2\alpha\,\Delta\theta$ $9^2 = 0^2 + 2(3)\Delta\theta$ $\Delta\theta = 13.5$ rad

$\Sigma M_G = M = I_G \alpha$ $I_G = \frac{1}{2}(0.175)(0.14)^2 = 0.001715$
        $M = 0.001715(3) = \boxed{0.005145 \text{ Nm}}$

$U = M(\theta_2 - \theta_1) = M(\Delta\theta) = 0.005145(13.5) = \boxed{0.0694575 \text{ J}}$