A 20-cm-diameter grinding wheel rotates at 2000 rpm. Calculate its angular velocity in rad/s

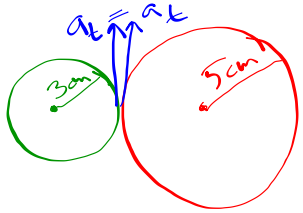
$$2000\ \frac{\text{Rot.}}{\text{min.}} \cdot \frac{2\pi\ \text{rad}}{\text{Rot.}} \cdot \frac{1\ \text{min}}{60\ \text{s}} =$$

$$209.3\ \frac{\text{rad}}{\text{s}}$$

18. Two rubber wheels are mounted next to one another so their circular edges touch. The first wheel, of radius R_1 = 3.0 cm, accelerates at a rate 0.88 rad/s^2 and drives the second wheel, of radius R_2 = 5.0 cm, by contact (without slipping).

a) Starting from rest, how long does it take the second wheel to reach an angular speed of 33 rpm?

b) What was the angular acceleration of the second wheel?



$$\alpha_1 = \frac{a_t}{r}$$

$$0.88\ \frac{rad}{s^2} = \frac{a_t}{3\,cm}$$

$$a_t = 2.64\ \frac{cm}{s^2}$$

$$\alpha_2 = \frac{a_t}{r_2}$$

$$\alpha_2 = \frac{2.64\ \frac{cm}{s^2}}{5\,cm} = \boxed{0.528\ \frac{rad}{s^2}}$$ b

2nd wheel r=5cm

$\theta_0 = 0$

$\theta = ?$

$\omega_0 = 0$

$\omega = 33\ \frac{rot}{min} \cdot \frac{2\pi\ rad}{rot} \cdot \frac{1\ min}{60\ s} = 3.45\ \frac{rad}{s}$

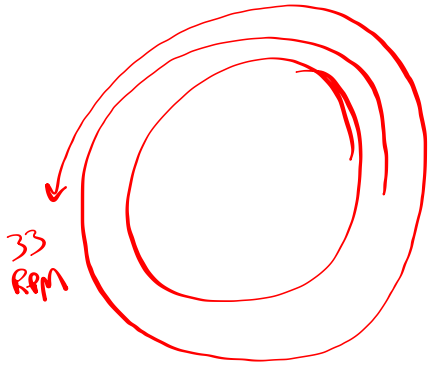
$\alpha = 0.528\ \frac{rad}{s^2}$

$t = ?$

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

$$t = \frac{\omega - \omega_0}{\alpha} = \frac{3.45}{.528} = 6.54$$

17. A pulley in a car reaches its rated speed of 33 rpm after making 1.5 revolutions. What was its angula acceleration, ~~assuming~~ that it was constant?



$\alpha = ?$

$\theta_0 = 0$

$\theta = 1.5\ \text{rev} \cdot \frac{2\pi\ \text{rad}}{\text{rev}} = 9.4\ \text{rad}$

$\omega_0 = 0$

$\omega = 33\ \frac{\text{rot}}{\text{min}} \cdot \frac{2\pi\ \text{rad}}{\text{rot}} \cdot \frac{1\ \text{min}}{60\ \text{s}} = 3.5\ \frac{\text{rad}}{\text{s}}$

$\alpha = ?$

$t = ?$

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

$\alpha = \frac{(\omega^2 - \omega_0^2)}{2(\theta - \theta_0)} = \frac{(3.5^2 - 0^2)}{2(9.4 - 0)} =$

$\alpha = 0.65\ \frac{\text{rad}}{\text{s}^2}$