Starting from rest at time t = 0, a grindstone has a constant angular acceleration of 3.2rad/s². What is the angular displacement after 2.7 s? If the radius of the grindstone is 0.24 m. Calculate the tangential and radial acceleration.

Angular displacement after 2.7 s:

$$\varphi = \frac{\beta t^2}{2}$$

$$\varphi = \frac{3.2rad/s^2 * (2.7s)^2}{2} = 11.66rad$$

First of all let's find an angular speed:

$$\omega = \beta t$$

Where β - angular acceleration.

$$\omega = 3.2rad/s^2 * 2.7s = 8.64rad/s$$

Centripetal acceleration:

$$a_n = \omega^2 R = (8.64rad/s)^2 * 0.24m = 17.92m/s^2$$

Tangential acceleration:

$$a_t = \beta R$$

$$a_t = 3.2rad/s^2 * 0.24m = 0.77m/s^2$$

Answer: $\varphi = 11.66rad,\ a_n = 17.92m/s^2, a_t = 0.77m/s^2$