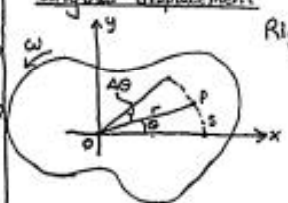
Review of Rotational Kinematics
Rotational Motion of Rigid Objects

- What is the equation for angular displacement?
- What are the units of angular displacement?
- What does s represent?

angular displacement

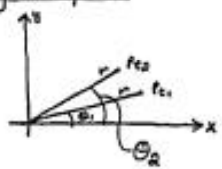


Rigid object rotating about fixed axis O in $\hat{z}$-direction

$\theta = 0$, when P is along x-axis
$\theta > 0$, CCW rotation
$\theta = s/r$, where s is arc length
$[\theta]$ = radians
$\Delta\theta$ = angular displacement

- What is the eq'n for average ang. speed?
- What is the eq'n for instantaneous ang. speed?

angular speed



avg. angular speed, $\bar{\omega} = (\theta_f - \theta_i)/(t_f - t_i)$
instantaneous ang. speed, $\omega = d\theta/dt$
$\omega > 0$, θ increasing in CCW direction
$[\omega]$ = rad/s

- How do we define instantaneous angular acceleration?

angular acceleration

avg. ang. acc., $\bar{\alpha} = (\omega_f - \omega_i)/(t_f - t_i)$
inst. ang. acc., $\alpha = d\omega/dt$ $\quad [\alpha] = rad/s^2$
$\alpha > 0$, ω increases w/ time $\quad \alpha < 0$, ω decreases w/ time

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Angular displacement is $\Delta\theta$, where $\theta = s/r$ = arc length/radius
$[\theta]$ = radians

Angular velocity is ω, where $\omega = d\theta/dt$ = change in displacement (ang. sense) / change in time
$[\omega]$ = rad/s

Angular acceleration is α, where $\alpha = d\omega/dt$ = change in angular speed / change in time
$[\alpha]$ = rad/s²