University Physics 1A

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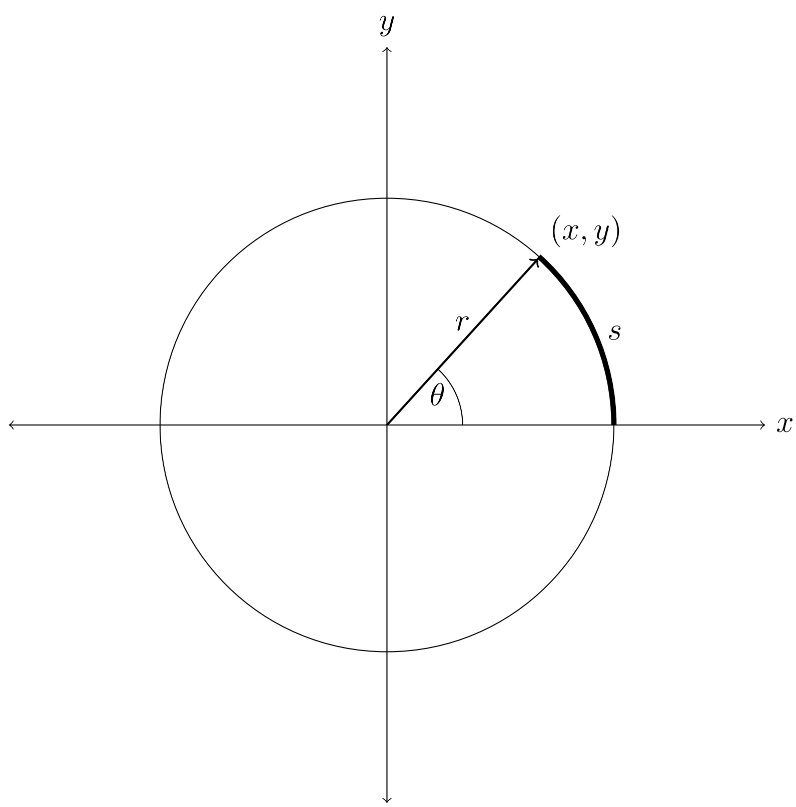
Angular Motion



$$\theta = \frac{s}{r}$$

Kinematics vs Rotational Motion

position	x	average position	θ
average velocity	$\frac{\Delta x}{\Delta t}$	average angular velocity	$\omega_{avg} = \frac{\Delta\theta}{\Delta t}$
instantaneous velocity	$\frac{\mathrm{d}x}{\mathrm{d}t} = v$	instantaneous angular velocity	$\omega = \frac{\mathrm{d}\theta}{\mathrm{d}t}$
acceleration	$a = \frac{\mathrm{d}v}{\mathrm{d}t}$	average acceleration	$\alpha = \frac{\mathrm{d}\omega}{\mathrm{d}t}$

$$\begin{aligned} s &= r\theta \\ \frac{\mathrm{d}s}{\mathrm{d}t} &= r\frac{\mathrm{d}\theta}{\mathrm{d}t} = r\omega = v \\ a_{centripetal} &= \frac{v^2}{r} = \frac{r^2\omega^2}{r} = r\omega^2 \\ a_{tangential} &= \alpha r \end{aligned}$$

θ and $\Delta\theta$ are not vectors. ω and α are vectors.

$$\text{Linear} \longleftrightarrow \text{Rotational}$$
$$\begin{aligned} v &= \frac{\mathrm{d}x}{\mathrm{d}t} \longleftrightarrow \omega \\ a &= \frac{\mathrm{d}v}{\mathrm{d}t} \longleftrightarrow \alpha \end{aligned}$$

Constant Acceleration

$$\begin{aligned} x &= x_0 + v_0 t + \frac{1}{2}at^2 \\ v &= v_0 + at \\ v^2 &= v_0^2 + 2a\Delta x \end{aligned}$$

Constant α

$$\begin{aligned} \theta &= \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2 \\ \omega &= \omega_0 + \alpha t \\ \omega^2 &= \omega_0^2 + 2\alpha\Delta\theta \end{aligned}$$

You can find all my notes at `http://omgimanerd.tech/notes`. If you have any questions, comments, or concerns, please contact me at alvin@omgimanerd.tech