

Concept, Principle, or Law: **Rotational Kinematic Formulas**

What do the Rotational Kinematic formulas mean?

The Rotational Kinematic formulas are the same 4 formulas we had for linear variables ($\Delta x, v_i, v_f, a, t$) but replaced with their angular counterparts ($\Delta \theta, \omega_i, \omega_f, \alpha, t$).

4 Rotational Kinematic Formulas

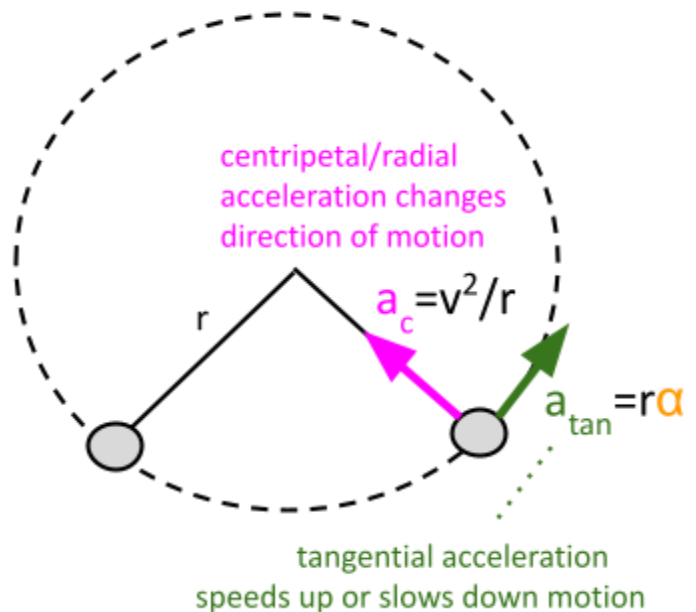
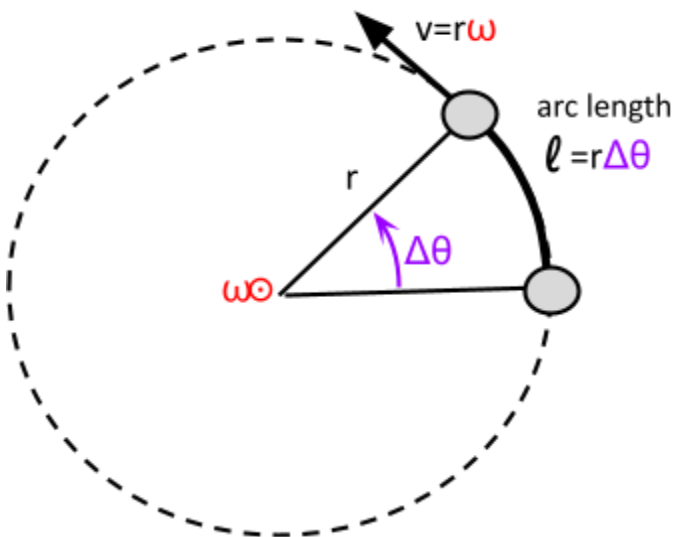
$$1. \omega_f = \omega_i + \alpha t$$

$$2. \Delta \theta = \omega_i t + \frac{1}{2} \alpha t^2$$

$$3. \omega_f^2 = \omega_i^2 + 2\alpha \Delta \theta$$

$$4. (\omega_f + \omega_i)/2 = \Delta \theta / t$$

Right hand rule to find direction of angular velocity ω .



Are there conditions that must be met in order for the Kinematic formulas to be true?

Yes, the Rotational kinematic formulas are only true if the **angular acceleration is constant**. (If the angular acceleration $\alpha = 0$, i.e. constant angular speed, then just use $\theta = \omega t$)

Warning: Don't mix up **centripetal acceleration** with **tangential acceleration**.

Code words: “starts from rest” means $\omega_i=0$, “stopped” means $\omega_f=0$, “constant velocity” means $\alpha=0$