PH202 Recitation 1

Rotational Kinematics

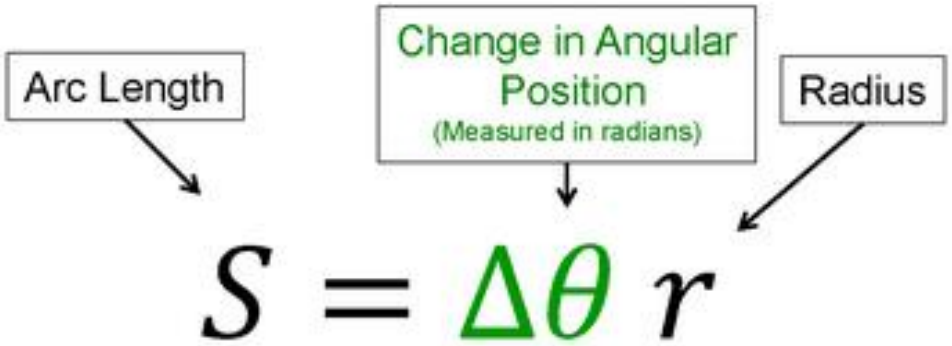
Warm-Up 1

- Say this equation in words

$$S = \Delta\theta\, r$$

Warm-Up 1 Solution

Arc Length



In words: The **arc Length** (distance) is equal to the **change in angular position** multiplied by the **radius**.

Warm-Up 2

- Say the equation in words

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

Warm-Up 2 Solution

Change in Angular Position

Change in Time

Change in Time squared

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

Initial Angular Velocity

Angular Acceleration

In words: The change in angular position is equal to the product of the initial angular velocity and the change in time plus one half the product of the angular acceleration and the change in time squared.

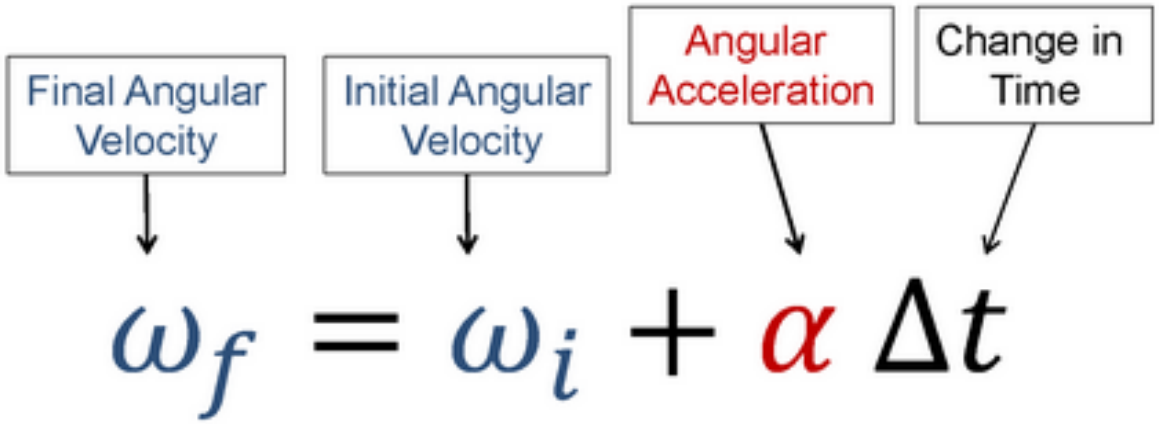
Warm-Up 3

- Say the equation in words

$$\omega_f = \omega_i + \alpha \Delta t$$

Warm-Up 3 Solution

Rotational Kinematic Equation II



In words: The **final angular velocity** is equal to the **initial angular velocity** plus the product of the **angular acceleration** and **change in time**

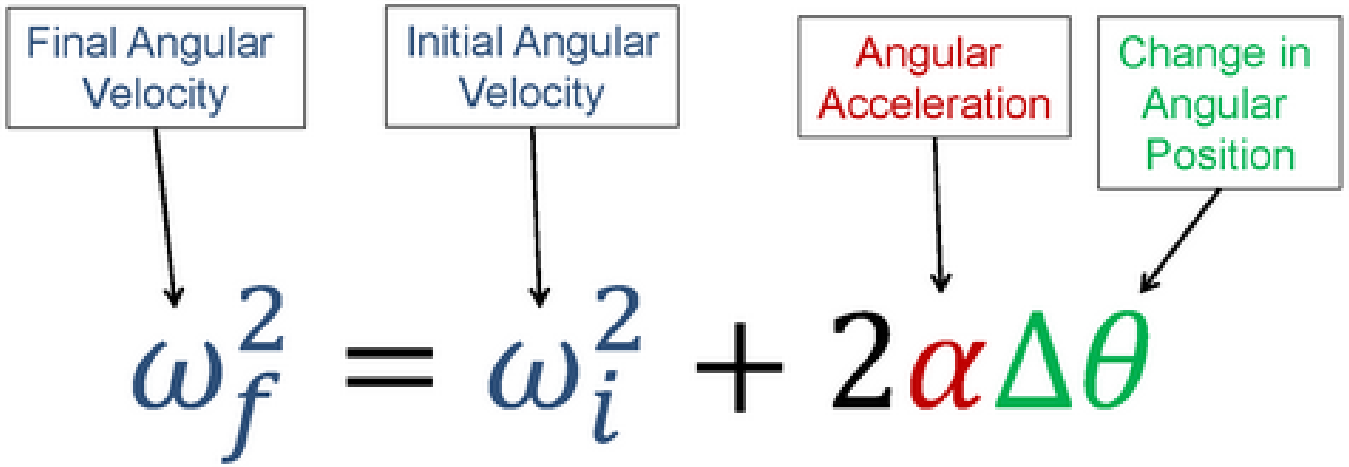
Warm-Up 4

- Say the equation in words

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

Warm-Up 4 Solution

Rotational Kinematic Equation III



In words: The square of the **final angular velocity** is equal to the square of the **initial angular velocity** plus twice the product of the **angular acceleration** and the **change in angular position**.

Discussion Question 1: 3 minutes

- The earth rotates once per day about its axis. Where on earth's surface should you stand in order to have the smallest possible tangential speed? Where would you stand in order to have the largest possible tangential speed? Why?

Discussion Question 2: 3 minutes

- 2 points are located on a rigid wheel that is rotating with a decreasing angular velocity about a fixed axis. Point A is located on the rim of the wheel and point B is half-way between the rim and the axis. Which of the following statements are true concerning this situation?
  A. Both points have the same radial acceleration
  B. Both points have the same tangential acceleration
  C. The angular velocity at point A is greater than that of point B
  D. Each second, point A turns through a greater angle than point B

Question 1: 7 minutes

- You put your favorite CD into a CD player to listen to some music as you do your Challenge Homework.
  A. If your CD (radius = 6cm) speeds up to a speed of 3600 revolutions per minute in 4s, what is the angular acceleration of the CD?
  B. How far did a point on the edge of the CD travel during that 4s?
  C. If the CD takes 6s to come to rest, what is the angular acceleration of the CD?

Question 2: 7 minutes

- At time t = 0, a wheel is rotating about it's axis with an angular velocity of 2 rad/s and is constantly accelerating. 2 seconds later the wheel has completed 5 revolutions. What is the angular velocity of the wheel after the 2 seconds?

Question 3: 7 minutes

- A lacrosse ball is thrown by rotating the stick through 90 degrees and then releasing the ball when vertical. If the stick starts at rest, is 1m long, and the ball has linear velocity of 10m/s at its launch, what is the angular acceleration of the stick?