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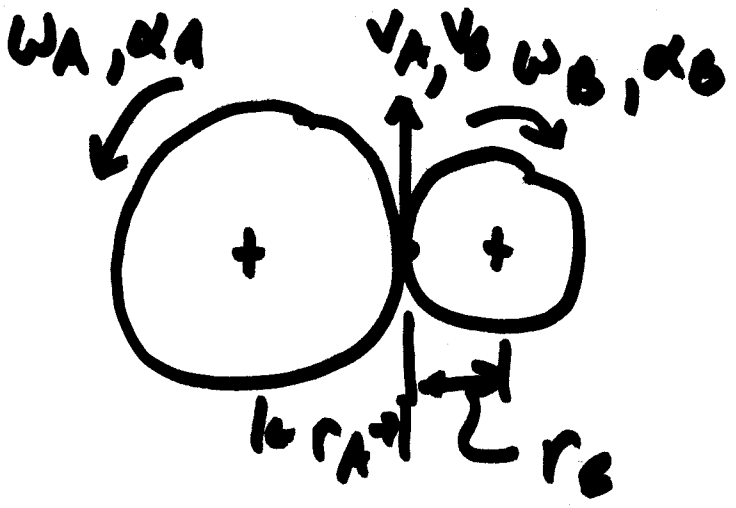

Because the gears mesh w/o slip, they share velocity at the mesh point

$$V_A = r_A \omega_A \qquad V_B = r_B \omega_B$$

$$V_A = V_B \Rightarrow r_A \omega_A = r_B \omega_B$$

↑ coord system $\omega_A > 0$, $\omega_B > 0$

For this example
z axis up for A,
z axis down for B.

Also have equal <u>tangential accels</u>

$$a_{tA} = a_{tB} \Rightarrow r_A \alpha_A = r_B \alpha_B$$

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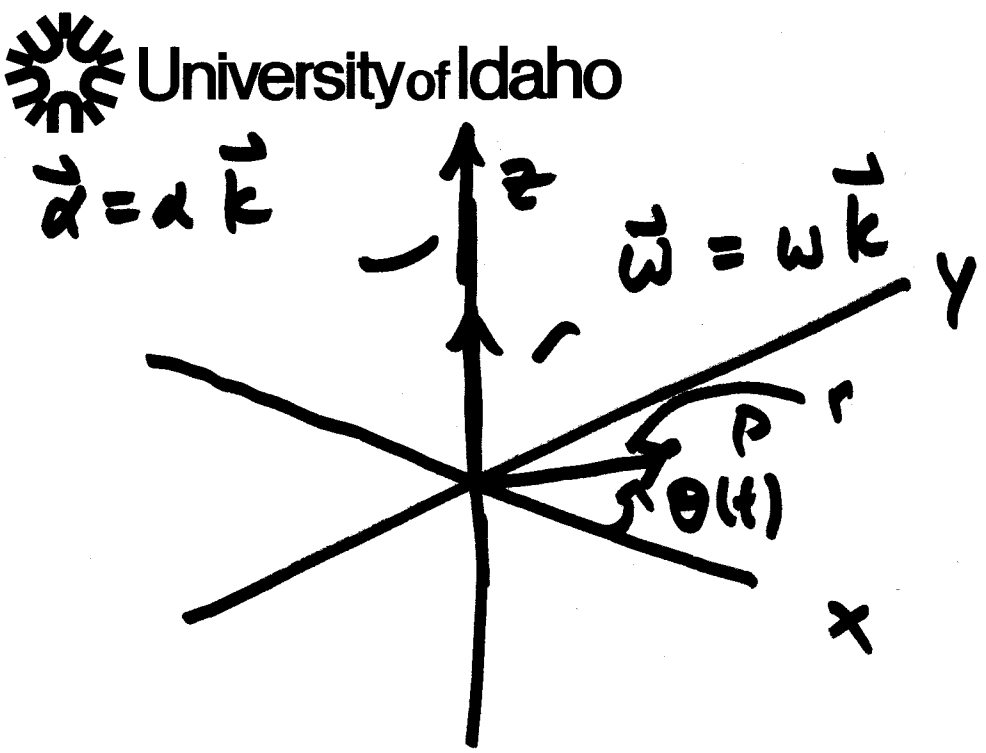

ω, α are the magnitudes of the angular acceln and velocity vectors.

$$\omega = \frac{d\theta}{dt} \; ; \; \alpha = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$$

Analogous to

$$v = \frac{dx}{dt} \; ; \; a = \frac{dv}{dt} = \frac{d^2x}{dt^2}$$

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Ptcle Translation

$$v = v_0 + at$$

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

$$v^2 = v_0^2 + 2a(x - x_0)$$

Constant accln a

If a not constant

$$v = \frac{dx}{dt} \qquad dx = v(t)\,dt$$

$$a = \frac{dv}{dt} \qquad dv = a(t)\,dt$$

$$a(x)\,dx = v\,dv$$

Fixed Axis Rotation

$$\omega = \omega_0 + \alpha t$$

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2} \alpha t^2$$

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$

Constant angular acch α.

If α not constant.

$$d\theta = \omega(t)\,dt$$

$$d\omega = \alpha(t)\,dt$$

$$\alpha(\theta)\,d\theta = \omega\,d\omega$$