

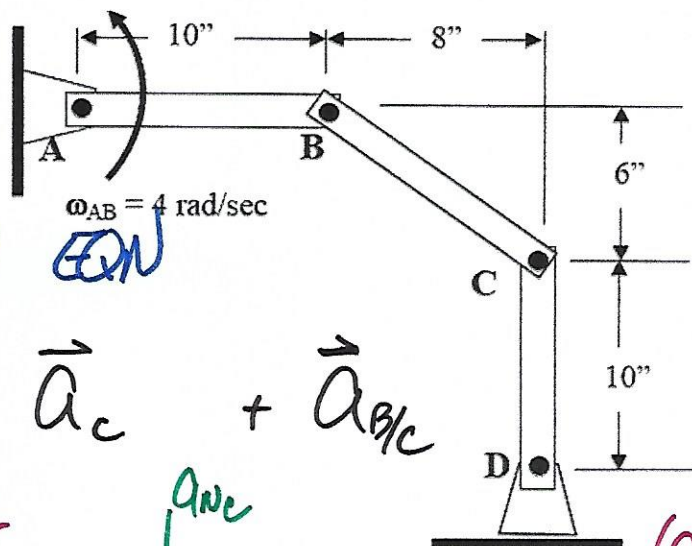
Rigid Body Kinematics III – Problem 1

In the position shown, bar AB has a constant angular velocity of 4 rad/sec counterclockwise. Determine the angular acceleration of bar CD.

$\omega_{BC} = 5 \text{ rps} \searrow$
 $\omega_{CD} = 3 \text{ rps} \nearrow$

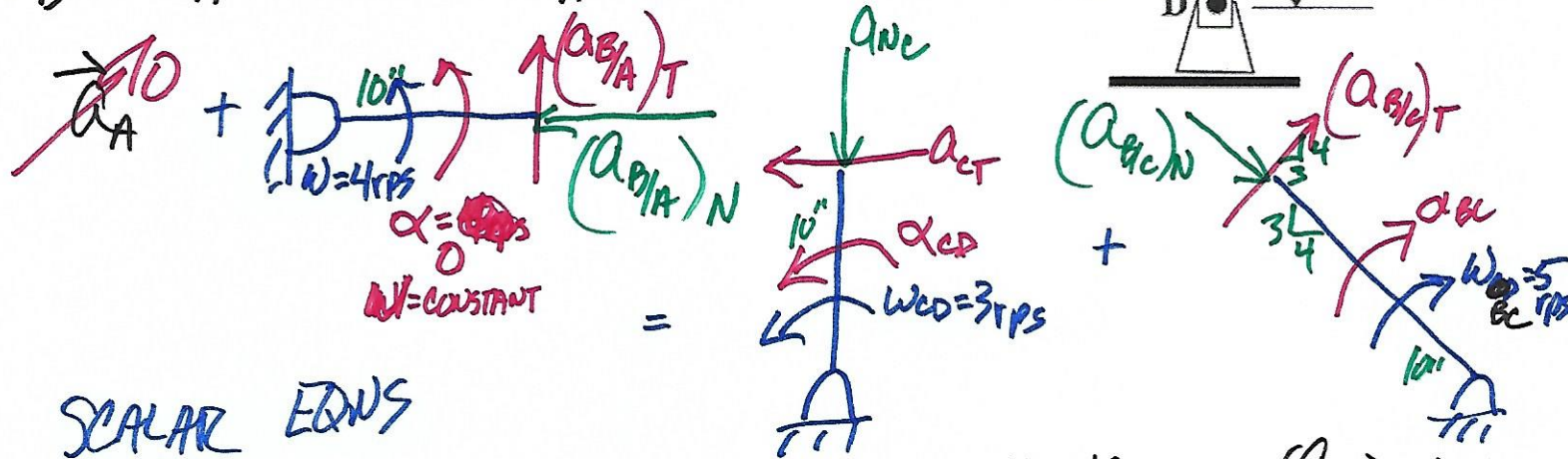
CLASSIFY MOTION

AB RAFA
 BC GPM
 CD RAFA



RELATIVE ACCELERATION EQN

$$\vec{a}_B = \vec{a}_A + \vec{a}_{B/A} = \vec{a}_C + \vec{a}_{B/C}$$



SCALAR EQNS

$$(a_{B/A})_T = \alpha_{AB} r_{AB} = 0$$

$$(a_{B/A})_N = \omega_{AB}^2 r_{AB} = (4)^2 (10) = 160$$

$$a_{C/T} = \alpha_{CD} r_{CD} = 10\alpha_{CD}$$

$$a_{C/N} = \omega_{CD}^2 r_{CD} = (3)^2 (10) = 90$$

$$(a_{B/C})_T = \alpha_{BC} r_{BC} = 10\alpha_{BC}$$

$$(a_{B/C})_N = \omega_{BC}^2 r_{BC} = (5)^2 (10) = 250$$

$$\rightarrow 0 - 160 = -10\alpha_{CD} + \frac{3}{5}(10\alpha_{BC}) + \frac{4}{5}(250)$$

$$\uparrow 0 + 0 = -90 + \frac{4}{5}(10\alpha_{BC}) - \frac{3}{5}(250)$$

$$\alpha_{BC} = 30 \text{ rps}^2 \searrow$$

$$\alpha_{CD} = 54 \text{ rps}^2 \nearrow$$