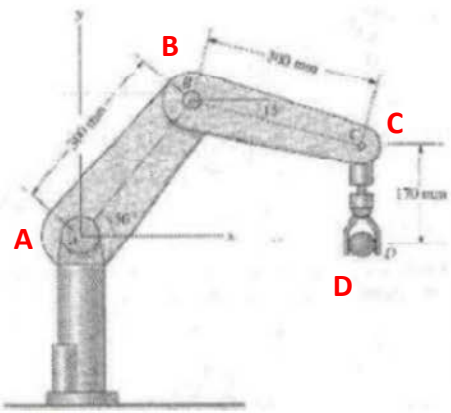
Problem 1. If arm AB has a constant clockwise angular velocity of 0.8 rad/s, arm BC has a constant clockwise angular velocity of 0.2 rad/s, and arm CD remains vertical, what is the acceleration of part D?



Classify Motion

AB - RAFA

BC - GPM

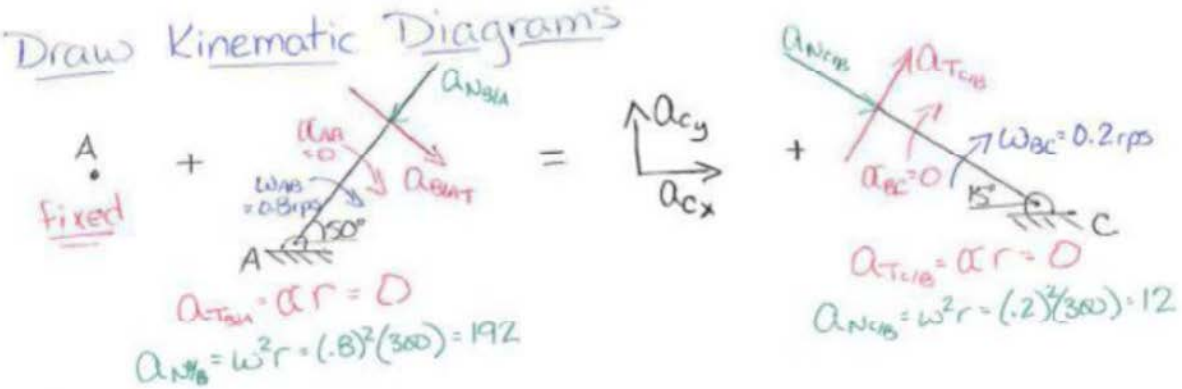
Note:

* pt B connects
* $a_C = a_D$
* constant velocity = accel of zero! (body properties)

Write Accel. Eqns

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

Draw Kinematic Diagrams



Solve Eqns

$$\rightarrow \quad 0 - 192\cos 50 = a_{c_x} + 12\cos 15 \Rightarrow a_{c_x} = -135 \text{ mm/s}^2$$

$$\uparrow \quad 0 - 192\sin 50 = a_{c_y} - 12\sin 15 \Rightarrow a_{c_y} = -144 \text{ mm/s}^2$$

$$a = \sqrt{135^2 + 144^2} = 197.4 \text{ mm/s}^2 \quad \angle 47°$$

Answer: $a_C = 197.4$ mm/s^2 at 47° CCW from horizontal