Problem 4

The crank-rocker mechanism as shown below consists of a crank rotating about its fixed center at C at a constant rate of 2 rad/s clockwise and a rocker AB fixed at it's base at A. A pin at point B is fixed to the edge of the crank and can slide along the frictionless slot in AB. In the current state, what is the angular velocity of rocker AB?

\[ x_B = S + S \cos(60°) = 0.75 m \]
\[ y_B = S + S \sin(60°) = 0.933 m \]
\[ d = \sqrt{0.75^2 + 0.933^2} = 1.197 m \]
\[ \phi = \tan^{-1}\left(\frac{0.933}{0.75}\right) = 51.21° \]

\[ \vec{V}_{C/A} = \vec{V}_{B/A} + \vec{V}_{C/B} \]
\[ \ddot{r} \hat{r} + r_1 \dot{\theta} \hat{\theta}_1 + r_z \dot{\theta}_z \hat{\theta}_z \]
\[ \ddot{r} = d \Delta 51.21° + (1.197)(\phi) \Delta 38.79° + (0.5)(-2) \Delta 30° \]
\[ \Delta \]

\[ \dot{X} = d \cos(51.21°) - 1.197 \cos(38.79°) \phi - 1 \cos(30) \]
\[ \dot{Y} = d \sin(51.21°) + 1.197 \sin(38.79°) \phi + 1 \sin(30) \]
\[ \dot{d} = 1.44 \phi + 1.38 \]
\[ Q = (1.44 \, \dot{\phi} + 1.38) \sin(51.21) + 1.197 \sin(38.79) \, \dot{\phi} + \sin(30) \]

\[ Q = 1.161 \, \dot{\phi} + 1.078 + 0.750 \, \dot{\phi} + 0.5 \]

\[ -1.578 = 1.911 \, \dot{\phi} \]

\[ \dot{\phi} = -0.826 \, \text{rad/s} \]