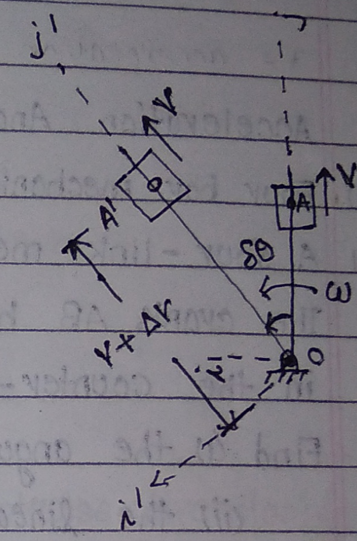
Coriolis acceleration.



At time 't', velocity of A w.r.t point 'O'

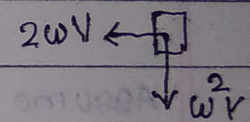
$$\vec{V}_{A/O} = \vec{V}_{A/B} + \vec{V}_{B/O}$$

$$\vec{V}_{A/O} = V\hat{j} + \omega r\,\hat{i}$$

At time 't+Δt', velocity A w.r.t point 'O'.

$$\vec{V}_{A'/O} = \vec{V}_{A'/B} + \vec{V}_{B'/O}$$

$$= V\hat{j}' + \omega(r+\Delta r)\,\hat{i}'$$



Direction of Coriolis acc.

$\vec{\omega} \times \vec{V}$

$$\hat{j}' = \cos\delta\theta\,\hat{j} + \sin\delta\theta\,\hat{i}$$

$$\hat{i}' = \cos(90^\circ+\delta\theta)\,\hat{j} + \sin(90+\delta\theta)\,\hat{i}$$

$$\hat{i}' = -\sin\delta\theta\,\hat{j} + \cos\delta\theta\,\hat{i}$$

$$\vec{V}_{A'/O} = V\cos\delta\theta\,j + V\sin\delta\theta\,\hat{i} - \omega(r+\Delta r)\sin\delta\theta\,\hat{j} + \omega(r+\Delta r)\cos\delta\theta\,\hat{i}$$

$$= (V\cos\delta\theta - \omega(r+\Delta r)\sin\delta\theta)\,\hat{j} + (V\sin\delta\theta + \omega(r+\Delta r)\cos\delta\theta)\,\hat{i}$$

$$\vec{a}_{A/O} = \lim_{\Delta t\to 0}\frac{\vec{V}_{A'/O} - \vec{V}_{A/O}}{\Delta t} = \lim_{\Delta t\to 0}\frac{V\cos\delta\theta - \omega(r+\Delta r)\sin\delta\theta - V}{\Delta t}\,\hat{j}$$

$$+ \lim_{\Delta t\to 0}\frac{V\sin\delta\theta + \omega(r+\Delta r)\cos\delta\theta - \omega r}{\Delta t}$$

$\delta\theta \approx$ small $\cos\delta\theta \approx 1$, $\sin\delta\theta \approx \delta\theta$

$$a_y = \lim_{\Delta t\to 0}\frac{\cancel{V} - \omega(r+\Delta r)\,\delta\theta - \cancel{V}}{\Delta t} = -\omega(r+\cancel{\Delta r}^{\,0})\frac{\delta\theta}{\delta t} = -\omega^2 r$$

$$a_x = \lim_{\Delta t\to 0}\frac{V\delta\theta + \cancel{\omega r} + \omega\Delta r - \cancel{\omega r}}{\Delta t} = V\omega + \omega V = 2V\omega.$$

$$\vec{a}_{A/O} = 2V\omega\,\hat{i} - \omega^2 r\,\hat{j}.$$