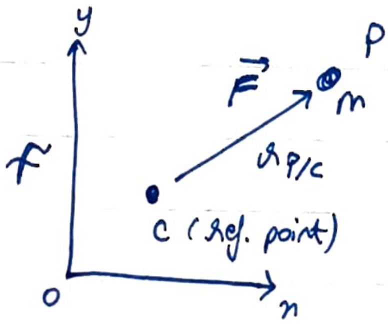
Q14. $\vec{F} = m\vec{a}$

$\vec{r}_{P/C} \times F = m\, \vec{r}_{P/C} \times \vec{a}$



$\vec{r}_{P/C} \times F = \frac{d}{dt} \vec{H}_{P/C}$

↳ find $\vec{H}_{P/C}$ to satisfy this eq^n

OPTIONS: (a) $\vec{H}_{P/C} = \vec{r}_{P/C'} \times \vec{V}_{P/O}\, m$ (C' is a stationary point coinciding with C at some time)

(b) $\vec{H}_{P/C} = \vec{r}_{P/C} \times \vec{V}_{P/C'}\, m$

(c) $\vec{H}_{P/C} = \vec{r}_{P/C} \times \vec{V}_{P/C}\, m$

Try (a) : $\dot{\vec{H}}_{/C} = m\frac{d}{dt} (\vec{r}_P - \vec{r}_{C'}) \times (\vec{V}_P - V_{C'})$

$= m(r_P - r_{C'}) \times (\vec{a}_P - \cancel{\vec{a}_{C'}}^{\,0}) + m\cancel{(v_P - \vec{v}_{C'}) \times (\vec{V}_P - \vec{v}_{C'})}^{\,0}$

$= m\, \vec{r}_{P/C'} \times \vec{a}_P$ ← Good guess of $\vec{H}_{/C}$ for stationary C.

Try (c) $\dot{\vec{H}}_{/C} = m\frac{d}{dt} [(\vec{r}_P - \vec{r}_C) \times (\vec{v}_P - \vec{v}_C)]$

$= m(\vec{r}_P - \vec{r}_C) \times (\vec{a}_P - \vec{a}_C) + m\cancel{(\vec{V}_P - \vec{V}_C) \times (\vec{V}_P - \vec{V}_C)}^{\,0}$

$= m\, \vec{r}_{P/C} \times \vec{a}_P - m\, \vec{r}_{P/C} \times \vec{a}_C$

This is a good guess for $\vec{r}_{P/C} \times \vec{a}_C = 0$ → $\vec{a}_C = 0$

→ $\vec{a}_C$ along $\vec{r}_{P/C}$

→ P & C coincide

Try (b) $\dot{\vec{H}}_{/C} = m\frac{d}{dt} [(\vec{r}_P - \vec{r}_C) \times (\vec{v}_P - \vec{V}_O)]$

$= m(\vec{r}_P - \vec{r}_C) \times (\vec{a}_P - \cancel{\vec{a}_O}^{\,0}) + m(v_P - \vec{v}_C) \times (\vec{V}_P - \cancel{\vec{V}_O}^{\,0})$

$= m\, \vec{r}_{P/C} \times a_P - m\, \vec{V}_C \times \vec{V}_P$

This is a good guess for $V_C \times V_P = 0$ → $|\vec{V}_C| = 0$ or $|\vec{V}_P| = 0$

→ $\vec{V}_C$ and $\vec{V}_P$ are along the same line