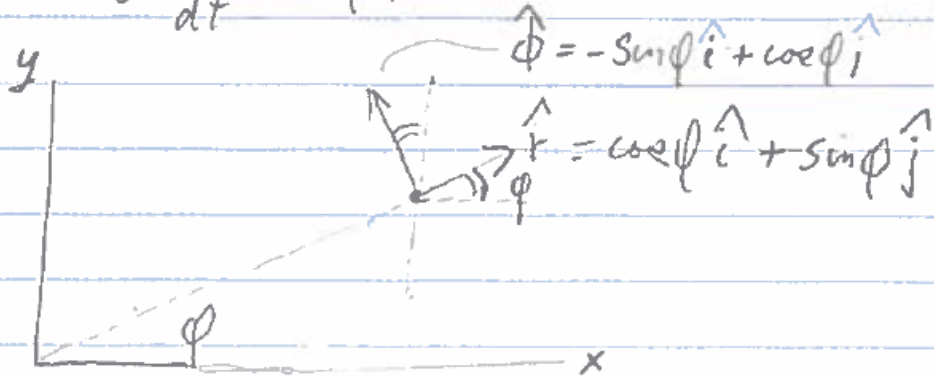


- T 1.43 Alternative "proofs" of the following 2 equations

$$\left. \begin{aligned} \frac{d\hat{r}}{dt} = \dot{\phi} \hat{\phi}, \quad \frac{d\hat{\phi}}{dt} = -\dot{\phi} \hat{r} \quad \text{with} \quad \vec{r} = r \hat{r} \end{aligned} \right\}$$



$$\left. \begin{aligned} \Rightarrow \hat{r} &= \cos\phi \hat{x} + \sin\phi \hat{y} \\ \hat{\phi} &= -\sin\phi \hat{x} + \cos\phi \hat{y} \end{aligned} \right\} \Rightarrow \hat{\phi} \cdot \hat{r} = 0$$

$$\left. \begin{aligned} \dot{\hat{r}} &= -\dot{\phi} \sin\phi \hat{x} + \dot{\phi} \cos\phi \hat{y} = \dot{\phi} \hat{\phi} \\ \dot{\hat{\phi}} &= -\dot{\phi} \cos\phi \hat{x} - \dot{\phi} \sin\phi \hat{y} = -\dot{\phi} \hat{r} \end{aligned} \right\}$$