positions ⟶ coordinates $r = 5\,m$, $\theta = 60°$

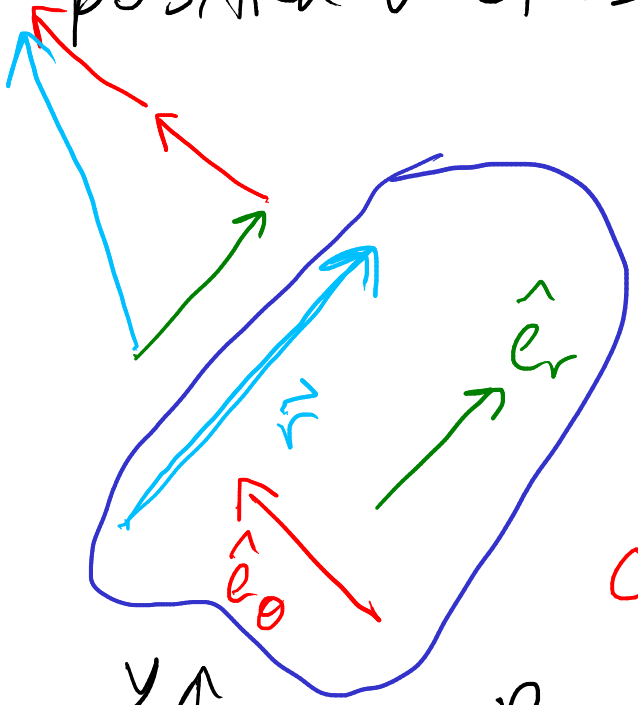
{polar coordinates of P

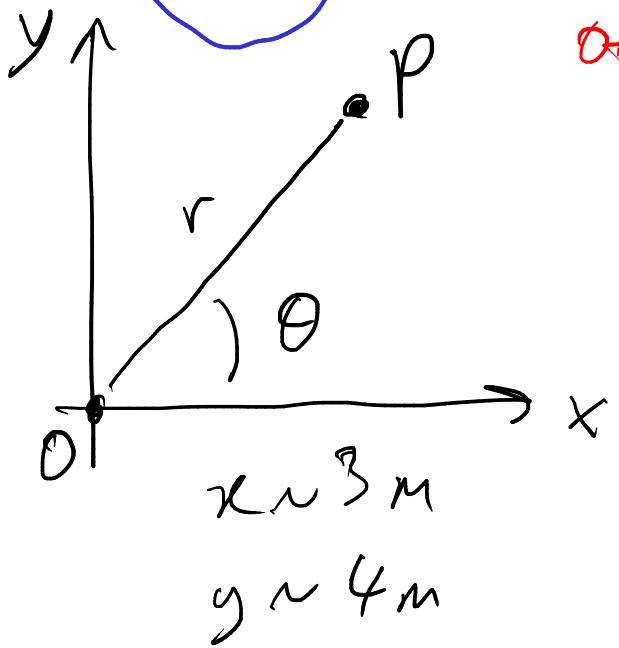
position vectors ⟶ components

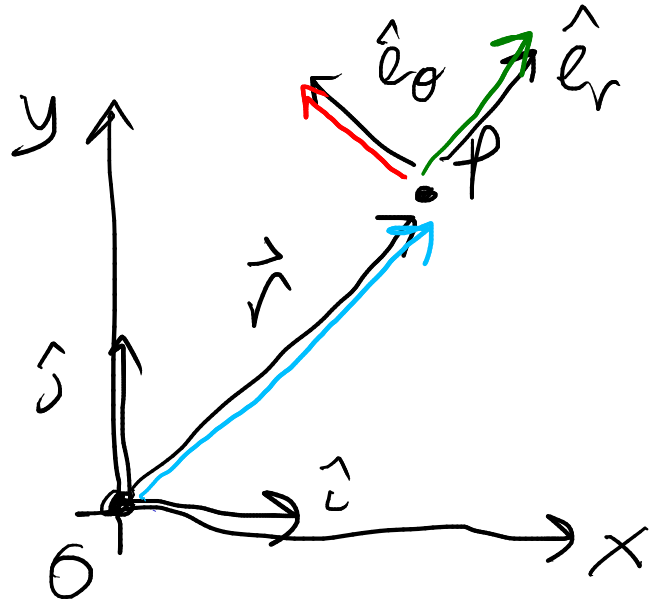
{components

$$\vec{r} = \overrightarrow{OP} = 3\,\hat{\imath} + 4\,\hat{\jmath} = 5m\,\hat{e}_r + 0\,\hat{e}_\theta$$

polar components of $\vec{r}$

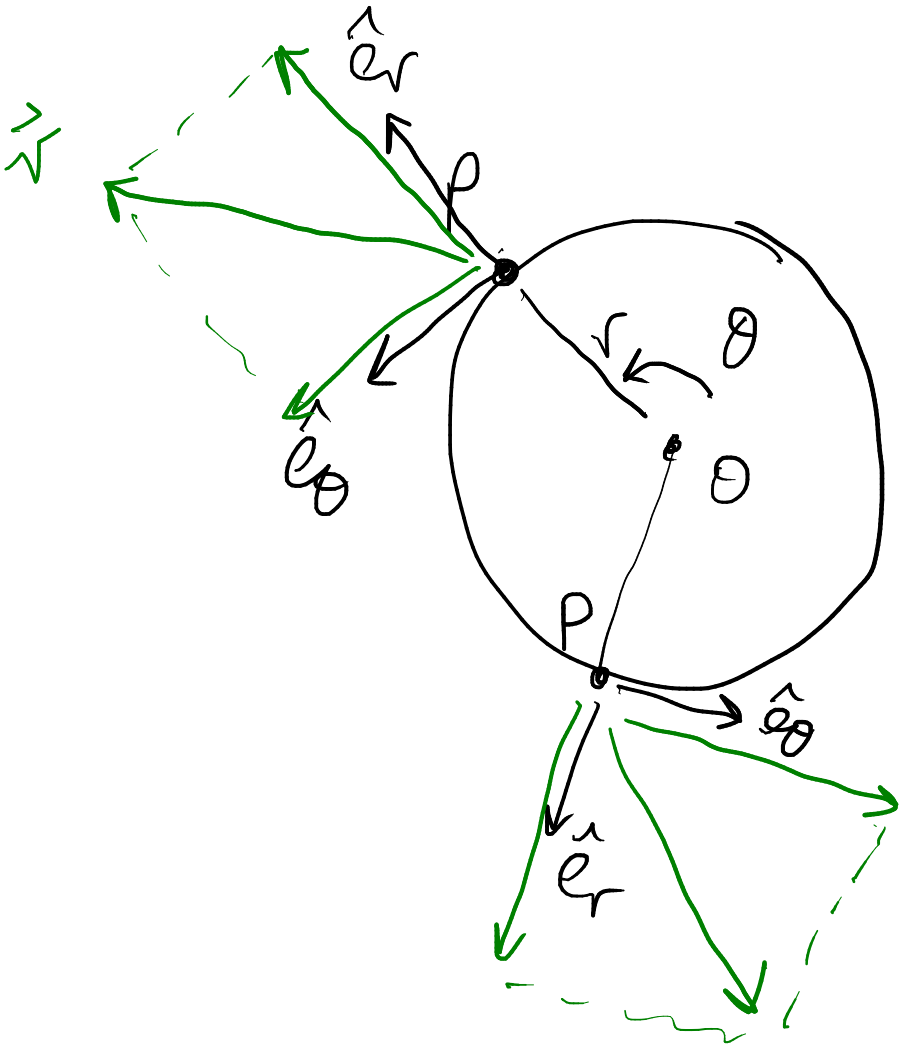






$$\vec{r} = r\hat{e}_r$$

$$\vec{v} = \dot{\vec{r}} = \dot{r}\hat{e}_r + r\dot{\hat{e}}_r = \dot{r}\hat{e}_r + r\dot{\theta}\hat{e}_\theta$$



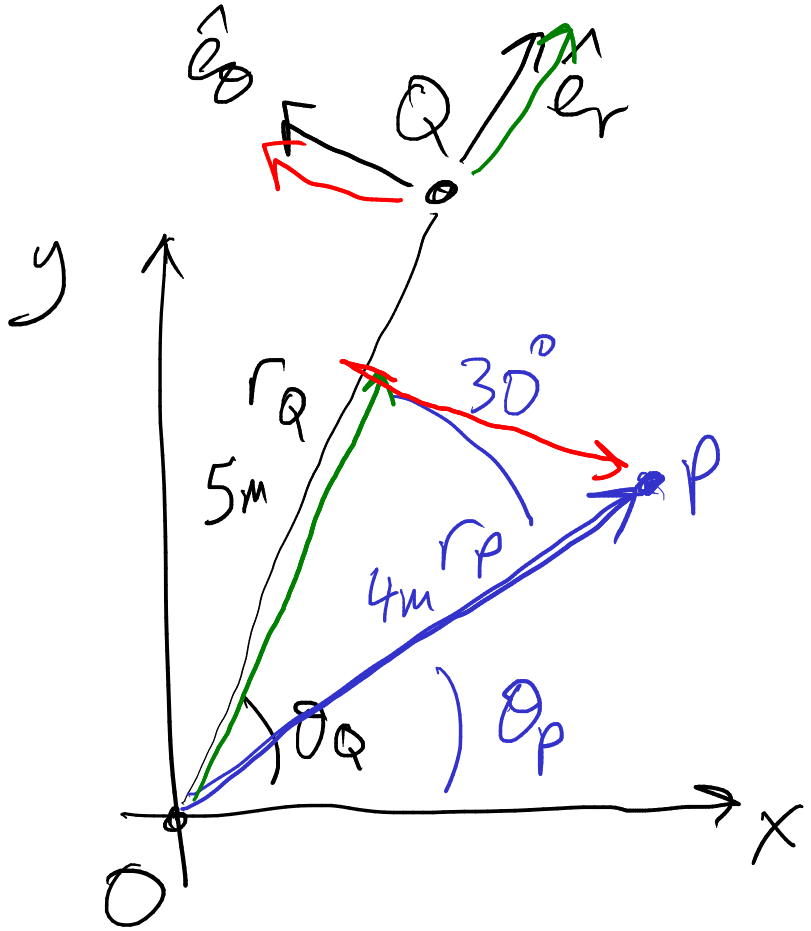
r increasing, $\dot{r} > 0$ $\Big\}$ $\dot{r}\hat{e}_r$

θ increasing, $\omega = \dot{\theta} > 0$ $\Big\}$ $r\omega\hat{e}_\theta$

$\dot{r} = 4\ ms^{-1}$

$\omega = 2\ rad/s$

$r = 1\ m$

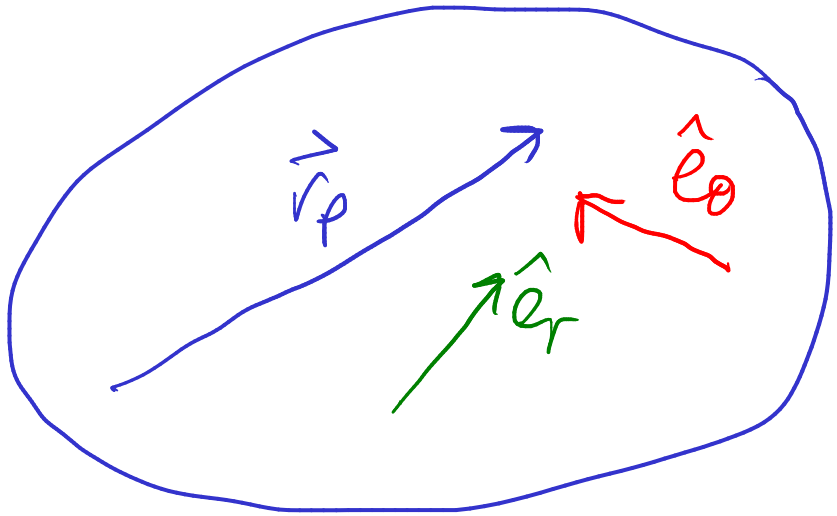


$$\vec{r}_Q = \vec{OQ}$$

$$= \underline{r_Q}\ \hat{e}_r + \underline{0}\ \hat{e}_\theta$$

$$\vec{r}_P = \underline{3m}\ \hat{e}_r + \underline{-2m}\ \hat{e}_\theta$$

$\vec{OP}$

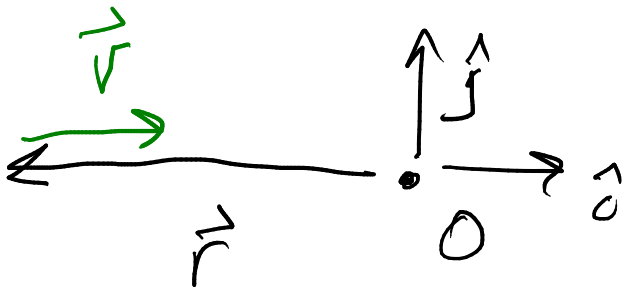


Speed $v = \sqrt{\dot{x}^2 + \dot{y}^2} \geq \sqrt{\dot{y}^2} = |\dot{y}|$

$\vec{r} = -10\,m\,\hat{i}$

$\dot{\vec{r}} = 3\,ms^{-1}\,\hat{i}$

$\dot{x}$



$x = x_0 + V_0 t + \frac{1}{2} a_0 t^2$

2 4