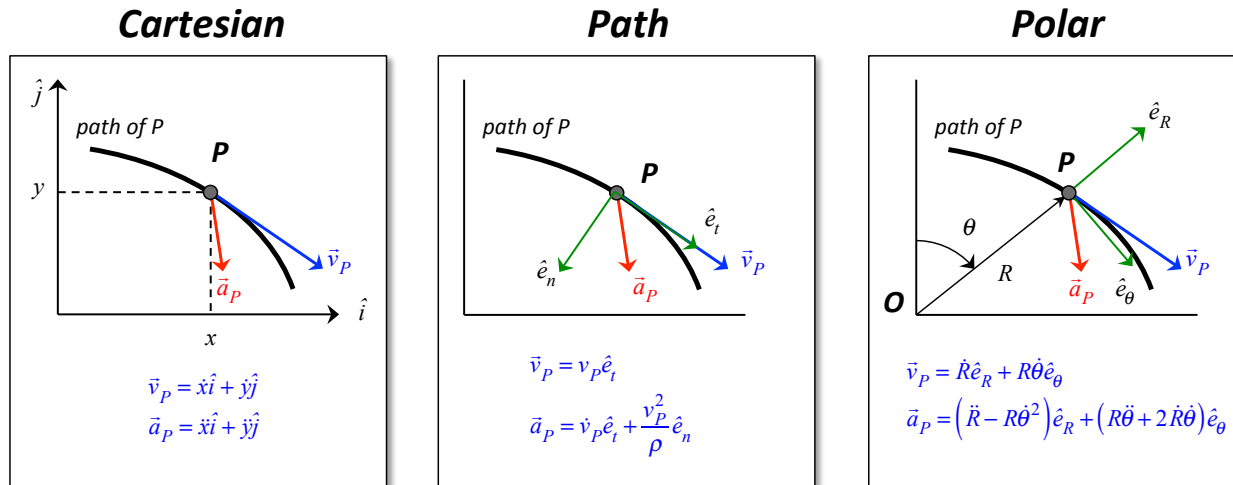


Summary: Particle Kinematics – Joint Description

PROBLEM: Motion of a point described in a combination of descriptions.



SOLUTION: Projection of vector onto different set of unit vectors. Examples:

$$\begin{aligned}
 \dot{x} &= \vec{v}_P \cdot \hat{i} & \dot{v}_P &= \vec{a}_P \cdot \hat{e}_t = \vec{a}_P \cdot \left(\frac{\vec{v}_P}{|\vec{v}_P|} \right) & \dot{R} &= \vec{v}_P \cdot \hat{e}_R & R \dot{\theta} &= \vec{v}_P \cdot \hat{e}_\theta \\
 \ddot{x} &= \vec{a}_P \cdot \hat{i} & \frac{v_P^2}{\rho} &= \vec{a}_P \cdot \hat{e}_n & \ddot{R} - R \dot{\theta}^2 &= \vec{a}_P \cdot \hat{e}_R & R \ddot{\theta} + 2 \dot{R} \dot{\theta} &= \vec{a}_P \cdot \hat{e}_\theta
 \end{aligned}$$