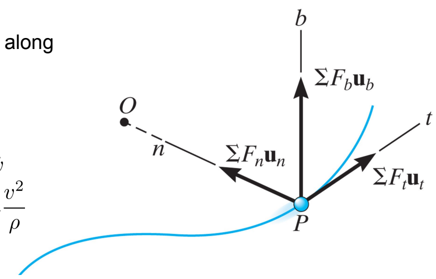
13.5 *n–t* Coordinates

- n–t–b coordinates
- convenient when moving along a path given by $y(x)$

$$\sum \vec{F} = m\vec{a}$$

$$\sum F_t = ma_t = m\dot{v}$$
$$\sum F_n = ma_n = m\frac{v^2}{\rho}$$
$$\sum F_b = 0$$



n–t–b directions defined such that there's no binormal acceleration

13.5 *n–t* Coordinates

- we need an ***inertial*** coordinate system
- if the coordinate system accelerates then

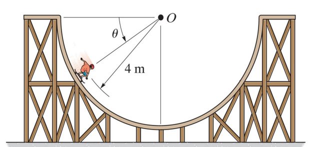
$$\sum \vec{F} \neq m\vec{a}$$

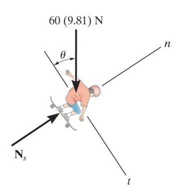
- the n–t–b coordinates we use will only apply at one point on the path

13.5 *n–t* Coordinates

- draw the FBD
- identify the n–t–b directions
- apply equations of motion

$$\sum F_t = m\dot{v}$$
$$\sum F_n = m\frac{v^2}{\rho}$$
$$\sum F_b = 0$$





13.5 *n–t* Coordinates

$$\sum F_t = m\dot{v}$$
$$\sum F_n = m\frac{v^2}{\rho}$$
$$\sum F_b = 0$$

radius of curvature given by:

$$\rho = \frac{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2}}{\left|\frac{d^2y}{dx^2}\right|}$$