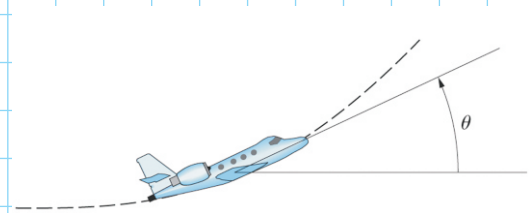
Name Date

Week: _____ **Problem:** _____

Given:

At the instant shown, the magnitude of the airplane's velocity is 130 m/s, its tangential component of acceleration is $a_t = -4$ m/s^2, and the rate of change of its path angle is $d\theta/dt = 5°/$s.

(a) What are the airplane's velocity and acceleration in terms of normal and tangential components?
(b) What is the instantaneous radius of curvature of the airplane's path?



Required:

Solution:

Solution:

$$\omega = (5°/\text{s})\left(\frac{\pi \text{ rad}}{180°}\right) = \left(\frac{\pi}{36}\right) \text{rad/s}$$

$$a_{P_t} = -4 \text{ m/s}^2,\ a_n = (130 \text{ m/s})\omega = 11.34 \text{ m/s}^2$$

(a) $$\boxed{\begin{aligned} \mathbf{v}_p &= (130\mathbf{e}_t) \text{ m/s} \\ \mathbf{a}_p &= (-4\mathbf{e}_t + 11.34\mathbf{e}_n) \text{ m/s}^2 \end{aligned}}$$

(b) $$\boxed{\rho = \frac{v^2}{a_n} = \frac{(130 \text{ m/s})^2}{11.34 \text{ m/s}^2} = 1490 \text{ m}}$$