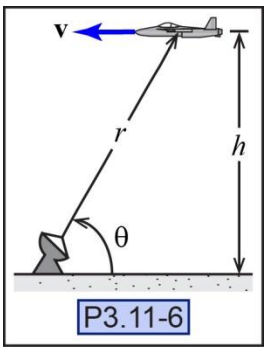
P3.11-6) An airplane flying horizontally at an altitude of h = 3 miles is being tracked by a radar station on the ground as shown. The radar's tracking data shows that $\dot{\theta}$ = 0.01 rad/sec and $\ddot{\theta}$ = -0.05 rad/sec^2 when θ equals 60^o. Determine the airplane's velocity and acceleration at this instant.



P3.11-6

Given:

Find:

Solution:

Derive the plane's velocity.

Write down the velocity equation in terms of polar coordinates.

v = _____

What is r as a function of θ.

r = _____

Calculate r when θ = 60^o.

$r_{\theta=60}$ = _____

Calculate the plane's velocity in the θ-direction.

v_θ = _____

Calculate the plane's velocity in the r-direction. This can be done using geometry or by taking the derivate of r with respect to time.

v_r = _____

v = _____

Derive the plane's acceleration.

Write down the acceleration equation in terms of polar coordinates.

a = _____

Calculate the plane's acceleration in the θ-direction.

a_θ = _____

Calculate the plane's acceleration in the r-direction. This can be done using geometry or by taking the second derivate of r with respect to time.

a_r = _____

a = _____