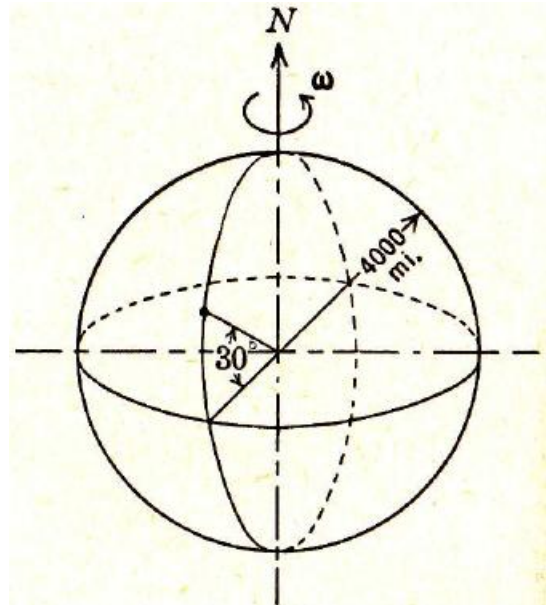


Problem 1: A river is flowing directly south along the surface of the earth at a uniform speed of 5 *mph* relative to the earth. What is the acceleration of a particle of water in the river when it crosses the 30° North latitude line? Use spherical coordinates with the origin at the center of the earth. Find the result in ft/s^2 .



Problem 2: The center of mass of a single engine airplane is travelling along a horizontal straight path with a velocity \vec{v} and acceleration \vec{a} . The angle of pitching of the airplane about the horizontal axis through its center of mass perpendicular to the flight path is $\phi = \phi_0 \sin pt$. The radius of the propeller is r_0 and its center is a distance d ahead of the center of mass. The propeller rotates at $\omega \text{ rad/s}$ clockwise as viewed from the rear.

- Find the velocity of the tip of the propeller blade at the time $t = 2\pi/p$ if the blade is horizontal and is moving upwards at that time (point A).
- Find the acceleration of the tip of the propeller under the conditions of part (a).

