A particle of mass $m$ is projected vertically up from a point on the Earth’s surface at northern latitude $\lambda$. (a) Find the deflection $(x_1, y_1)$ of the path from the vertical at $z_1 = h$, where the particle reaches its maximum height. Use the local frame of reference with the origin at the launch site and the axes as shown. Express the result as a function of $\lambda$ (angle of latitude), $\omega$ (angular frequency of Earth’s rotation), $g$ (acceleration due to gravity), and $h$ (maximum height reached by particle). Keep only terms up to linear order in $\omega$. (b) Find the deflection $(x_2, y_2)$ of the path at $z_2 = 0$, when the particle strikes the ground.

Solution: