



# Homework III

A bullet is fired vertically upward with velocity  $w_0$  from a point on earth. Show that in absence of friction, the projectile will land a distance

$$\frac{4w_0^3\Omega}{3g^2} \cos \phi$$

to the west of the firing point.

Calculate this distance for a bullet fired vertically (a) at 300m/s from equator. (b) 550m/s from  $10^\circ$  N.

- **Hint:**
  - (a) A parcel with velocity  $\mathbf{c} \equiv \mathbf{u} + \dot{\mathbf{R}}$  in the plane perpendicular to the axis of rotation experiences a Coriolis force (per unit mass) of magnitude  $2\Omega|\mathbf{c}|$ .
  - (b) The Coriolis force is directed in the plane perpendicular to the axis of rotation, at right angles to  $\mathbf{c}$ .
  - (c) If the planetary rotation is clockwise (or counterclockwise) as viewed from space, the Coriolis force is directed toward the left (or right) of the velocity vector. Thus, when viewed from above, the Coriolis force is directed toward the right of the velocity vector in the Northern Hemisphere and toward the left in the Southern Hemisphere.