

**Problem Set 9 due Wednesday, December 6 at 5 PM**

1. Problem 10.9
2. Problem 10.19
3. Consider a frictionless puck on a horizontal turntable that rotates counterclockwise with a constant angular velocity  $\Omega$ . Ignore the rotation of the Earth. In a coordinate system attached to the turntable with the origin on the rotation axis the puck has initial coordinate  $(x_0, 0)$  and initial velocity  $(v_x, v_y)$ . Determine the subsequent motion of the puck on the turntable given by  $x(t)$ ,  $y(t)$ . Hint: It is convenient to consider the variable  $s = x + iy$
4. The Compton generator is a simple device to demonstrate the Coriolis force due to the Earth rotation. It consists of a narrow glass tube bend into a closed ring that is completely filled with water and some small particles to observe the motion of the water in the tube. Initially the ring is horizontal and the water is stationary. The ring is then quickly rotated by  $180^\circ$  around its East-West diameter and stopped. Show that immediately after the rotation the water inside the tube will circulate with a velocity given by  $2\Omega R \cos\lambda$ , where  $R$  is the radius of the ring,  $\Omega$  is the Earth rotation rate and  $\lambda$  is the latitude. Assume the diameter of the glass tube is much smaller than the diameter of the ring.