Tarea 7

Se entrega el Viernes 31 de Octubre

1. What are the directions of the centrifugal and Coriolis forces on a person moving (a) south near the North Pole, (b) east on the equator, and (c) south across the equator?

2. A particle of mass m is confined to move, without friction, in a vertical plane, with axes x horizontal and y vertically up. The plane is forced to rotate with constant angular velocity Ω about the y axis. Find the equations of motion for x and y, solve them, and describe the possible motions.

3. Let S be a noninertial frame rotating with constant angular velocity Ω relative to the inertial frame S_0. Let both frame have the same origin (i.e. $\mathcal{O} = \mathcal{O}'$).

   a) Find the Lagrangian $\mathcal{L} = T - V$ in terms of the coordinates r and $\dot{r}$ of S. Remember that you must first evaluate T in the inertial frame. In this connection, recall that $v_0 = v + \Omega \times r$.

   b) Show that the equations of motion are $m\ddot{r} = F + 2m\dot{r} \times \Omega + m(\Omega \times r) \times \Omega$.

4. Consider a platform that is rotating about the z -axis with constant angular velocity $\omega = \omega\hat{k}$ in the inertial reference frame $\mathcal{O}$. Let $\mathcal{O}'$ denote a reference frame that is rotating with the platform. An object of mass m is connected to a string that is pulled radially inward along the surface of the platform at a constant speed v in $\mathcal{O}'$. At the instant shown in Figure 1, the object is at a distance $r = r'$ from the center of the platform. What is the velocity of the object v in the reference frame $\mathcal{O}$?

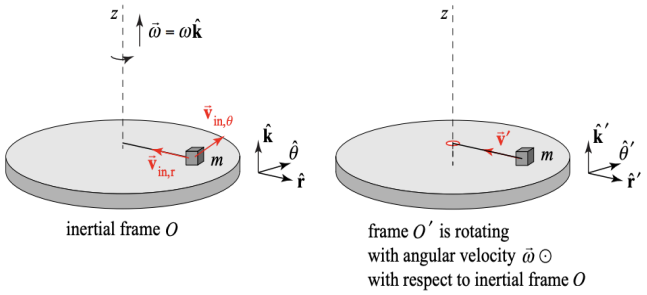

Figura 1: Reference System $\mathcal{O}$ and $\mathcal{O}'$