

Homework 8: Phys 5210 (Fall 2021)

Tien Vo

October 25, 2021

Problem 1: Ever since the 16th century, we know that Earth orbits the Sun and not the other way around. However, we are modern scientists and understand that there's nothing wrong with looking at cosmos from the point of view of the Earth reference frame. In that reference frame the Sun rotates around the Earth, making a full rotation in close to 24 hours. The Sun is massive and its distance to the Earth is large, thus the centripetal force which makes it move this way must be very large. Identify the force which makes the Sun move in this way and show that it provides correct acceleration to the Sun in the reference frame which rotates with the Earth. Take into account that the vector connecting Earth with the Sun forms an angle $\theta < \pi/2$ with the Earth's angular velocity $\boldsymbol{\Omega}$. Neglect Earth's orbiting the Sun and the Sun's movement relative to the center of the galaxy. In other words, you can assume for the purpose of this problem that both the Earth and the Sun are stationary in space relative to distant galaxies, and that the Earth rotates about its axis with a constant angular velocity.

Solution.

□

Problem 2: Solve for the motion of the Foucault's pendulum. It is a pendulum attached to a very high ceiling of a building located at a latitude ϕ , swinging back and forth along the floor with frequency ω . For the purpose of calculating its kinetic energy, neglect the vertical motion of the pendulum, taking its movement as two dimensional. How long does it take for the plane of oscillations to do one full rotation?

Solution.

□