Homework 10

Prerequisites: Read chapters 9 and 10.

Problem 1 (4 points):

Read section 9.9 of the book (i.e. the Foucault pendulum). Solve the problem for the following initial conditions $x_0 = 0$ and $y_0 = A$ at $t_0 = 0$.

Plot position of the pendulum in 'xy' plane at the end of each fast motion with frequency w_0 for one day duration starting from time t_0.

Assume that $A = 1$ m and the pendulum is located in Williamsburg.

Problem 2 (4 points):

Suppose we have a train tracks going along a particular latitude around the Earth and a train is moving westward with the constant velocity v_0. There is a Foucault pendulum attached to the ceiling of the train. How long does it take this pendulum to rotate the pendulum plane of motion. I.e. if the pendulum starts motion along 'y' plane when will do it again. Note: the plane needs to rotate only by π radians. The train moves at Williamsburg's latitude and its velocity $v_0 = 60$ km/s.

Hint: it might be convenient to move your reference frame to the train.

Problem 3 (4 points):

Follow the derivation which we did in the class regarding tidal forces. Find the difference between maximum and minimal tides level caused by the Moon in Virginia Beach.

Assume, that the Earth is a sphere covered by water. Also, assume that the Moon's orbit is in the equatorial plane. Disregard the Sun presence.

Problem 4 (4 points):

Do problem 10.2 (about spinning wheel) from the book.

Problem 5 (4 points):

Do problem 10.14 (about rotation of the space station) from the book.