January 1986 – Oral Exam

A pendulum consists of a mass particle $m$ suspended by a string of length $L$ in a gravity field $g$. The natural frequency of small oscillations of the pendulum is $\omega_n = \sqrt{\frac{g}{l}}$. In a proposed space station the crew is to live in a doughnut shaped space which rotates at constant angular rate $\Omega$. It is argued that the centrifugal field will simulate the gravity field that the crew is accustomed to. Compare the small-oscillation behavior of the pendulum described above when it’s point of suspension $O$ is at radius $R$ and

a. The pendulum oscillated in the plane through $O$ perpendicular to the central axis $A-A$.
b. The pendulum oscillates in the plane of the sketch. In particular how do the natural frequencies compare with $R = L$?

\[ DYNAMICS – Oral Quals \]