

PHYSICS 331 ADVANCED CLASSICAL MECHANICS
Problem Set 28

Problem 1

Thornton and Marion: Chapter 10, Problem 3.

Problem 2

Thornton and Marion: Chapter 10, Problem 19.

Problem 3

You are spinning a bucket of water about its vertical axis with angular velocity Ω . Show that, once the water has settled in equilibrium (relative to the bucket), its surface will be a parabola (a paraboloid). HINT: Use cylindrical polar coordinates and remember that the surface is an equipotential under the combined effects of the gravitational and centrifugal forces.

Problem 4

Consider the situation where you are wearing crampons (outdoor footwear that features metal parts to provide traction on snow and ice) on a perfectly frictionless, flat merry-go-round, which is rotating counter-clockwise with angular velocity Ω about its vertical axis.

- (a) You hold a puck at rest just above the floor of the merry-go-round and release it. Describe the puck's path as seen from above by an observer who is looking down from a nearby tower (fixed to the ground) and also seen by yourself on the merry-go-round.
- (b) Answer the same question for a puck which is released from rest by a long-armed spectator who is standing on the ground leaning over the merry-go-round.

Bonus

Read the problem described in Thornton and Marion: Chapter 10, Problem 17 and identify what is wrong with the statement of the problem. NB: You are not being asked to solve this problem; however, you may do so if you wish.

Other Things

Read Taylor's chapter 10, section 10.1 – 10.3. Also, skim Thornton and Marion: Chapter 11, sections 11.1 – 11.3. Please remember to submit your journal entry. Compare the readability of each text as part of your journal entry.