

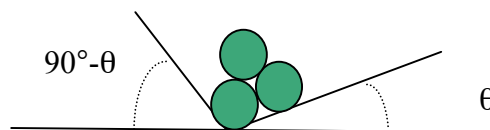
PHYSICS 180

Problem Set # 9

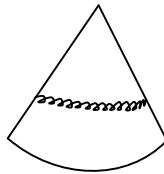
due: November 30, 2007

"If you don't believe it, you won't understand it"
... St. Augustine (354-430)

1. Three smooth identical cylinders are piled as shown (in end view) against smooth (frictionless) walls. What is the minimum angle, θ , that allows them to be stacked as shown with each cylinder touching two others?



2. A circular chain of unknown length and weight W rests on a frictionless right circular cone of height h and base radius r . What is the tension in the chain? *Hint: Consider this from an energy perspective.*



3. The 2×10^4 kg space shuttle *Endeavour* is in a circular orbit 250 km above the Earth's surface when it fires its rockets to put it into a new orbit with maximum distance 325 km and minimum distance 200 km. By how much has its total energy and angular momentum changed in the Earth's frame of reference?
4. Show that a comet, approaching the sun from outside the solar system, can be deflected by the planet Jupiter into an orbit around the sun.
Hint: Assume that the comet has a very low velocity (< 1 km/s) at a very great distance from the sun. Consider the comet in Jupiter's frame. After the deflection, transform the comet back into the sun's frame and show that the maximum velocity of the comet is less than the escape velocity from the sun.

This is a mechanism whereby our solar system can accumulate mass.

Practice problems:

Ch.12: 4, 9,15,19,31,35,40,44,52,56

Ch.13: 12,13,16,21,24,29,32,37,41,46,53,61