

PHYSICS 331 ADVANCED CLASSICAL MECHANICS
Problem Set 1

Problem 1

Thornton and Marion: Chapter 2, Problem 24.

Problem 2

Thornton and Marion: Chapter 2, Problem 32.

NB: Answers are in the back of the book, beginning on p. 633. Don't look at the answer until you are certain you have the correct answer.

There are several ways to gauge the confidence you have in your answer. First of all, do the problem entirely with variables first, e.g. call the length of the slope x_1 , and the length of the horizontal part x_2 , and use θ , m , and g for the angle, mass, and gravitational acceleration. Once you have an answer for μ and the intermediate speed in terms of the variables, (a) check the dimensions of your answers, (b) check your μ value in the limit $x_2 \rightarrow \infty$, (c) check your answer for the intermediate speed in the limits $x_2 \rightarrow 0$, $g \rightarrow 0$, $x_1 \rightarrow 0$, $\theta \rightarrow 0$, and $\theta \rightarrow 90^\circ$ (in which case the speed is that of free fall over the vertical distance x_1).

Having checked the limiting cases, and ensuring that they make sense, then enter your specific numbers into your answers and confirm the answer in the back of the book. If the limits are reasonable, then your answer is likely to be correct.

As for 2-32, check the limits such as $\mu \rightarrow 0$. Also, if you end up with an equation with both $\sin \theta$ and $\cos \theta$, then isolate the $\cos \theta$ term, square both sides, substitute $\cos^2 \theta = 1 - \sin^2 \theta$ and then solve for $\sin \theta$.

Other Things

Don't forget that you have a journal assignment as well. Submit your comments about the reading via email. Mention what parts you understand, what parts you don't, what seems interesting to you—and what doesn't, along with any other comments that you feel are relevant for the reading. Focus your comments on the reading from sections 2.1–2.4, but also skim through Chapter 1 and make some short comments about your familiarity with vectors and matrices.

Your journal entries must be submitted by 8AM Friday, but it would be very helpful if you could do it early (Thursday evening) to allow me more time to look at your comments.