Warm-up problems to be done BEFORE recitation #3
Physics 271, Fall 2017

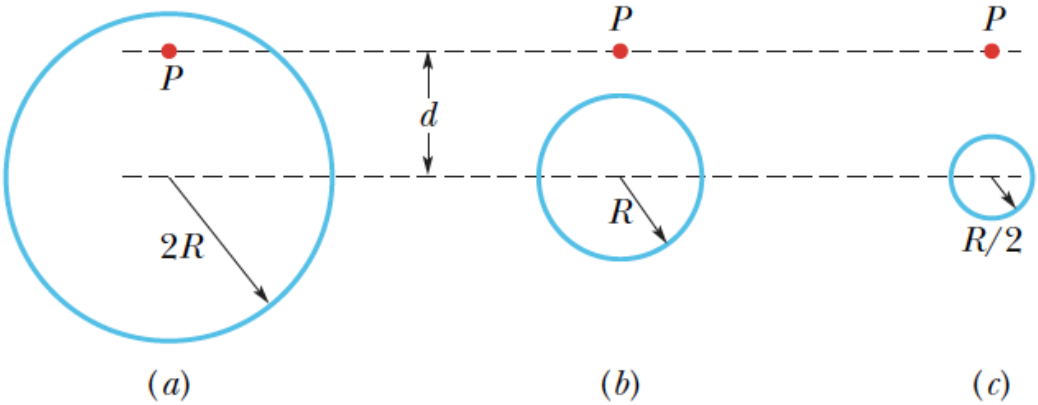
Note: these 5 problems should seem pretty easy. You can check your answers by going back to the recitation web page and clicking on the links you find there. If you find you are rusty or never learned the topic properly, please review the relevant section of a standard college-level textbook or find materials on the internet, and/or come to office hours before this week's recitation.

1. FRICTION (STATIC AND KINETIC)
A 68 kg crate is dragged across a floor by pulling on a rope attached to the crate and inclined 15 degrees above the horizontal.
(a) If the coefficient of static friction is 0.50, what minimum force magnitude is required from the rope to start the crate moving?
(b) If the coefficient of kinetic friction is 0.35, what is the magnitude of the initial acceleration of the crate?

2. DRAG FORCE AND TERMINAL SPEED
The terminal speed of a sky diver is 1.6×10^2 km/h in the spreadeagle position and 3.1×10^2 km/h in the nosedive position. Assuming the force has the form $\mathbf{F} = -C\,\mathbf{v}$, what is the ratio $C_{spreadeagle}/C_{nosedive}$?

3. SIMPLE HARMONIC MOTION: SPRING FORCE
A 0.12 kg body undergoes simple harmonic motion of amplitude 8.5 cm and period 0.20 s.
(a) What is the magnitude of the maximum force acting on it?
(b) If the oscillations are produced by a spring, what is the spring constant?

4. GRAVITATIONAL FORCE: SHELL THEORM
The figure shows three situations involving a point particle P with mass m and a spherical shell with a uniformly distributed mass M. The radii of the shells are given. Rank the situations according to the magnitude of the gravitational force on particle P due to the shell, greatest first.



5. GRAVITATIONAL FORCE: ORBITS

Assuming that the Earth is a perfect sphere with mass $M_E = 5.98 \times 10^{24}$ kg and radius $R_E = 6.37 \times 10^6$ m and is fixed in space (also note $G = 6.673 \times 10^{-11}$ m^2/kg^2),

(a) what linear speed must an Earth satellite have to be in a circular orbit at an altitude of 1.60×10^2 km above the Earth's surface?

(b) what is the period of revolution?

*most of these are adapted from Halliday Resnick and Walker 10th ed Chapter 6, 13 and 15.