

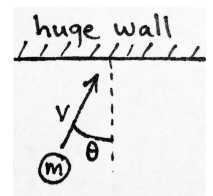
Name: _____ NetID: _____

NYU Physics I—Term Exam 3

Problem 1: (from lecture 2017-10-10) A soft rubber ball of mass 0.1 kg drops from a height of about 1 m onto a concrete floor and bounces. What is the mean force on the ball from the floor while it is contact with the floor? Imagine that the ball is in contact with the floor for about 10^{-4} s . If you need to assume anything else to solve the problem, state your assumptions.

Problem 2: (from lecture 2017-10-17) Without using a calculator, estimate the sine of the angle 0.06 deg . Use the small-angle approximation! (*Hint:* Degrees aren't radians.)

Problem 3: (from bouncing worksheet) An elastic ball of mass m heads at speed v towards a huge wall. Its initial velocity is at an angle of θ to the normal. Imagine that the collision is perfectly elastic and the wall is perfectly frictionless, so the “angle of incidence equals the angle of reflection”. What is the magnitude of the momentum change of the ball (final minus initial)? Give your answer in terms of the symbols in the diagram.



Problem 4: (from Problem Set 5, problem 1) A small particle of mass M and a small particle of mass m are separated by a distance R . How far is the center of mass of the system from the center of the M particle? Give your answer in terms of M , m , and R . If you have to assume anything else to answer the question, say what that is.

Problem 5: (from Problem Set 6, problem 3) A heavy package of 200 kg is dragged 3 m horizontally across a surface by a horizontal rope. The coefficient of sliding friction is $\mu = 0.2$. How much heat is generated by this? Assume $g = 10 \text{ m s}^{-2}$, and give your answer in Joules. If you need to assume anything else to solve this problem, state it.

Problem 6: (from Problem Set 6, problem 4) Choose the pivot as the axis for rotation, and counter-clockwise rotations or torques as positive torques. What is the torque on the beam m_b from the cable T_1 ? Give your answer in terms of the quantities given on the diagram.

