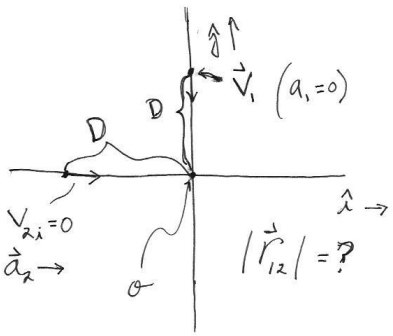
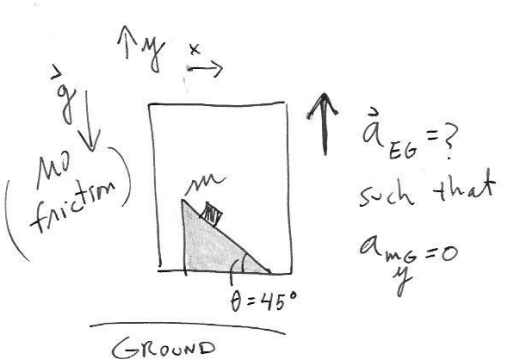
Physics 4A Exam 1 Spring 2014 Name_____

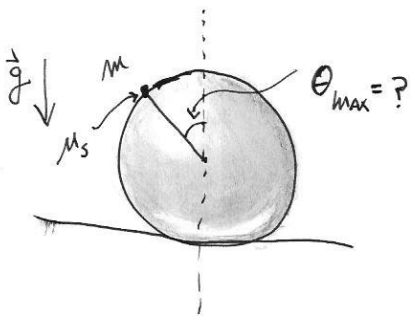
1. (25 points) Refer to the diagram. Object 1 has a constant given velocity in the downward direction as shown. Object 2 is moving to the right starting from rest but accelerating to the right with a given value of a_2. **Find the distance between 1 and 2 as a function of time** (i.e., find the magnitude of the position vector of 1 relative to 2 as a function of time). Gravity is irrelevant in the problem.



2. (25 points) There is no friction in this problem. **Find the magnitude of the upward acceleration of an elevator relative to the ground** (i.e. find a_{EG}) such that the mass, as shown in the diagram, slides along the inclined plane (angle given as 45 degrees) with a <u>zero acceleration in the vertical direction only</u>, relative to the ground. **Under this condition, also find the magnitude of the horizontal acceleration of the mass relative to the ground.**



3. (25 points) Consider the diagram. A fixed non-rotating sphere of radius R is in a uniform gravity field (the sphere is not a planet). Static friction is present and μ_s is given. Find the maximum angle from the vertical where the mass can be placed on the sphere before it *just* starts to slip.



4. (25 points) A mass *m* is tied to a string of length L and is rotating in a horizontal circle such that the string makes a constant given angle of θ with respect to the vertical as shown. Under these conditions, **find the time it would take for the mass to complete one circle.** There is gravity in the problem.