Lab03 Sample Calculation

I want you to follow through this derivation and include it in your lab writeup.

A mass m is on an inclined plane. The plane is inclined at an angle θ and the coefficient of kinetic friction between the mass and the plane is μ.

(a) Draw a sketch of the problem, showing all forces.

(b) Resolve the weight into a component along the plane and perpendicular to the plane.

(c) Sketch a free body diagram. Here you can assume an acceleration will exist.

(d) Write Newton's laws.

(e) Apply Newton's laws to obtain 2 equations and the equation for the frictional force.

(f) Solve for N, and f and then:

(g) Show how you obtain the result: $a=g\left(\sin(\theta)-\mu\cos(\theta)\right)$.

(h) Now imagine the plane is tilted just enough so that a=0. Show that under this condition, $\mu=\tan(\theta)$.

(i) Suppose that a material in contact with another material had a coefficient of μ=0.5. At what angle would the plane need to be tilted so that the material would slide without acceleration?