AP/Honors Quiz: Inclined Planes and Intuition

Full Name, Period, AP/Honors:

1 Sometimes it is the concept that is hard

1. (3 pt, **All**) An object is placed on a ramp on the surface of a planet at an angle θ from the horizontal. The object begins to accelerate at 12 $\frac{\text{m}}{\text{s}^2}$ down the plane. Which of the following is definitely true?
   A. The planet is not Earth
   B. There is no friction
   C. The angle of the ramp is at least 45°
   D. None of the above

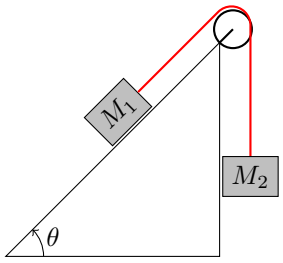
2. (4 pt, **AP**) Two people with different masses (a child and an adult) push each other on a surface with very low (but non-zero) friction coefficient μ_k which is located on Earth. Who stops first?
   A. The child
   B. The adult
   C. They stop at the same time
   D. Both move with constant velocity

3. (**All**) You and a friend return to NoFrictionLand™, where there is no friction.
   (a) (4 pt, **Honors**) You and your friend are at rest. You throw a ball to your friend, after your friend has caught the ball, what happens to his velocity? There is no air resistance.
      A. Your friend moves with constant velocity.
      B. Your friend moves with constant acceleration.
      C. Your friend initially moves, but eventually comes to a stop.
      D. Your friend remains stationary.
   (b) (3 pt, **All**) Someone allows air into the room and turns on a giant fan. Your initial velocity is $10\frac{\text{m}}{\text{s}}$. The fan creates a constant wind of 20 $\frac{\text{m}}{\text{s}}\hat{\text{x}}$, what is your terminal velocity?
      A. 10 $\frac{\text{m}}{\text{s}}$
      B. 15 $\frac{\text{m}}{\text{s}}\hat{\text{x}}$
      C. 20 $\frac{\text{m}}{\text{s}}\hat{\text{x}}$
      D. There is no terminal velocity.

4. (0 pt, **All**) Write your name, period, and AP status on the top of the paper. Then write a treatise on what it means to do physics.

2 Other times it is the math

1. You attach two masses together with a string and place one on a plane inclined with an angle θ as shown. There is no friction.



(a) (3 pt, **All**) The system is placed on earth and the masses do not move. Find the angle θ in terms of M_1, M_2 and g.

(b) (3 pt, **All**) The setup is still on earth as in part a, and everything is identical except that another M_2 is added directly below the original M_2. Find the acceleration of the system.

(c) (4 pt **Honors**) The system is exactly as it was in part a. Find the tension in the string.

(d) (4 pt, **AP**) The system is exactly as it was in part a, except that the whole thing is removed from Earth and placed in an elevator accelerating to the right with $\vec{a} = a_x\hat{\mathrm{x}}$. There is no gravity. Find the acceleration of M_2 as seen from the elevator.