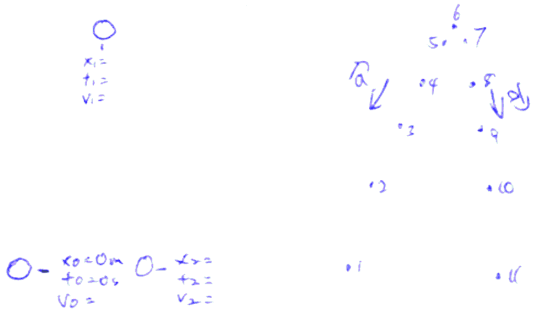
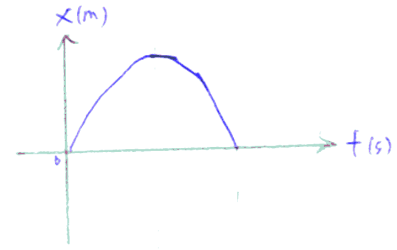
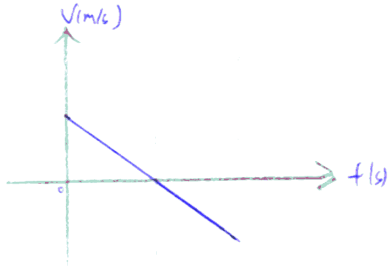
Physics 2048C Test 2 Solutions Dr. Jeff Saul
Fall 2001

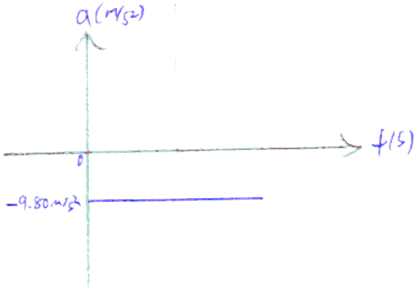
Problem 3 (Essay 10 points)
You may use words, diagrams, and equations but no calculations in your response for this problem.

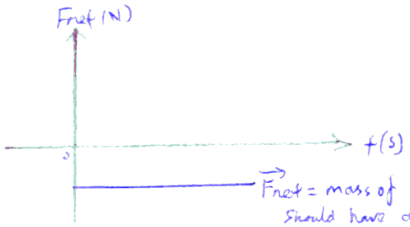
Recall that you were asked to assume that air resistance is negligible on this test.



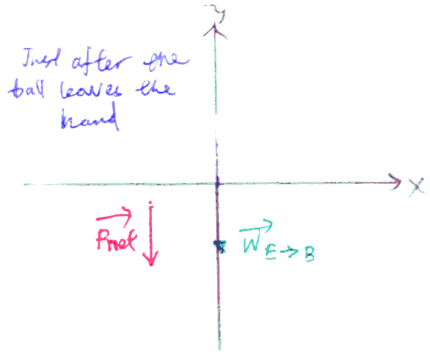


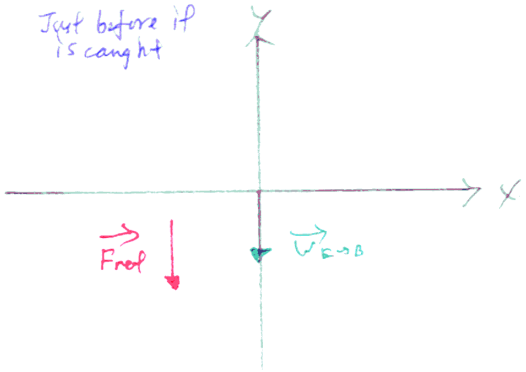






$\vec{F}_{net}$ = mass of ball × acceleration
should have a positive magnitude but pointing downward.





As the ball leave the bat, it move upward but with a decreasing velocity as the gravity of earth is acting on it.
At its highest pt, velocity = 0 m/s
It starts to fall back to earth increasing its speed ($|\vec{v}|$) because the gravity of the earth is now in the same direction as the velocity, pointing downward.

While this is a good answer to the question of what happens to the ball between the time it is hit and when it is caught, it doesn't discuss the ball's motion in terms Newton's Laws of motion. It does have good graphs and free body diagrams.

Problem 3 (cont.)

To be complete, a solution should mention the following points: According to Newton's 0th law, objects only feel forces that act on the object at the moment in question. Thus once the ball leaves the bat, it forgets about the bat and only feels the gravitational force due to gravity from the earth. After the ball leaves the bat, the ball has an upward velocity. Between the time the ball is hit and when it is caught, by Newton's 1st law, since there is a net force there must be a change in the velocity of the ball. From Newton's 2nd law, the acceleration of the ball equals the net force acting on the ball divided by the mass of the ball. Since the net force is equal the weight force, the magnitude of a = mg/m = g and the direction of a is downward in the direction of the net force. Thus a is downward and equal in magnitude to g for the entire time the ball is in the air between the time it is hit and when it is caught, even at maximum height when the velocity = zero m/s.

Comment: While we can say that a ball has a downward acceleration, an acceleration cannot pull down on a ball. Pulling or pushing requires a force.