Freefall with Tracker (19 pts)

- Position vs. time graph (4 pts)
- Velocity vs. time graph (2 pts)
- Acceleration vs. time graph (2 pts)

3a. The slope of the position graph transitions from positive to zero to negative. The value of the velocity graph transitions from positive to zero to negative. (1 pt)

3b. The slope of the velocity graph is negative and constant. The value of the acceleration graph is negative and constant. (1 pt)

3c. In the second half of the graphs, the acceleration is negative, but the softball is speeding-up because the magnitude of the velocity graph slope is increasing. (1 pt)

3d. At the apex of flight, the acceleration graph remains around -10m/s^2 and does not jump-up to 0m/s^2. Secondly, the slope of the velocity graph does not become zero at the apex of flight. It remains a slope of about -10m/s/s. Thirdly, the position graph maintains its curvature at the apex; a curvature implies a changing slope and a changing velocity, so the acceleration is not zero. (2 pts for any two of the three)

3e. The position graph would be stretched vertically and horizontally. The velocity graph would begin with a higher y-intercept and end with a more negative value, taking more time. The acceleration graph would remain the same, though last longer. (2 pts)

Several answers suggested the velocity slope would change if the ball was thrown faster, but the slope would remain -10m/s/s, the acceleration due to gravity.

3f. Experimental acceleration due to gravity, found by looking at the A value in the velocity graph window. (1 pt)

3g. Percent error of answer (3e) from 9.80 m/s^2. (1 pt)

3h. The heavy and light objects land at the same time, suggesting the acceleration due to gravity for both objects is the same, regardless of weight. This is not the same as saying that the force of gravity is the same on each object, which is not true. (2 pts)