(2.07) - Freely Falling Objects Worksheet

1. Which of the following can be defined as a freely falling object?
   a. A commercial airliner flying horizontally through the air.
   b. A soccer ball that is kicked into the air at a 45 degree angle above horizontal
   c. A parachutist descending at constant velocity downward towards Earth.
   d. A rock after being thrown straight up into the air by a student.

2. A student stands on the ground while holding a tennis ball in his hand. The student throws the ball straight up into the air and after a short time, catches the ball in his hands at the same height the ball was released from. Create qualitative (no numbers) X-T, V-T, and A-T graphs for the motion of the tennis ball while it is in the air.

3. Peggy drops a quarter from the top of her high school's stadium bleachers, which are 9 meters above the ground. How long will it take the quarter to reach the ground below?

4. Jose tosses a rock straight up into the air with a velocity of 10 m/s. If upon release, Jose's hand is 0.9 m above the ground, to what maximum height above the ground will the ball reach?

5. For his senior prank, Allen stands on the roof of his school and throws a water balloon straight down at his unsuspecting physics teacher. If Allen's hand is 12m above the ground when it lets go of the balloon, and the balloon is thrown downward with a speed of 3 m/s, with what velocity will the balloon strike the teacher's head, which is 1.8m above the ground?

6. How long would it take an object to reach the ground if it were thrown straight up into the air with a velocity of 5 m/s and from a height of 2 m?

Challenging

7. Anthony drops a water balloon from the roof of his high school, releasing it 29.0 m above the ground. At the same instant, his friend Jenna throws a second balloon from a window on the school's 3rd floor, releasing it 15.0 m above the ground.
   a. In which direction, and how fast should Jenna throw the balloon so that her and Anthony's balloons hit the ground at the same time?