Free Fall Homework

Name: _____

Hour: _____ Date: _____

Solve each of the following problems in the space provided. Show all of your work and circle each answer. Assume no air friction for all problems.
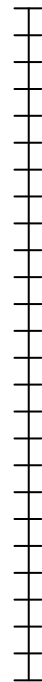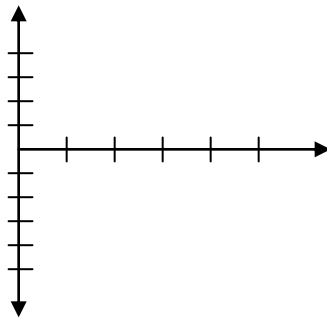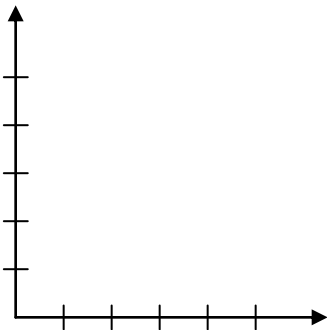
$$\Delta y = \tfrac{1}{2}gt^2 + v_{0y}t \qquad v_y = gt + v_{0y} \qquad v_y^2 = v_{0y}^2 + 2g\Delta y \qquad g = \text{-10 m/s/s}$$

1. An object is dropped from a tall building 125 m above the ground and hits the ground 5 seconds later.
   a. Create a t, y and v_y data table.
   b. Graph y vs. t and v_y vs. t.
   c. Draw a **quantitative** motion map for the flight of the object (v and a arrows please).

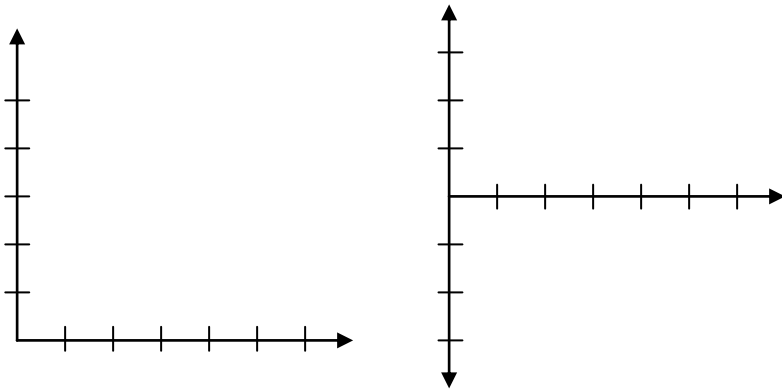| Time (s)	y	v

2. A body (not a dead one) falls freely from rest at a height of 80 m.
   a. How long after it is dropped does it hit the ground?
   b. What is the speed of the object just as it hits the ground?

3. A marble dropped from a bridge strikes the water in 6.0 s.
   a. At what speed does it hit the water?
   b. What is the height of the bridge?

4. A ball is dropped from the top of a tall building 45 m above the ground.
   a. How fast is the ball moving when it hits the ground?
   b. How far has the ball fallen when the velocity of the ball is −20 m/s?

5. An object on the moon is dropped from a height of 20 m and hits the ground moving at 8 m/s.
   a. Calculate 'g' on the moon.
   b. How long did it take for the object to reach the ground.

Free Fall with $v_0 \neq 0$

6. A ball is thrown upward from the ground with a speed of 30 m/s and lands 6 s later.
   a. Create a t, y and v_y data table.
   b. Graph y vs. t and v_y vs. t.
   c. Draw a motion map for the flight of the object (v and a arrows please).

Time (s)	y	v

7. A rocket is launched upward from the ground and lands 8 seconds later.
   a. What was the launch velocity of the rocket?
   b. What was the maximum height of the rocket?

8. From the top of a tall building, a body (not a dead one) is thrown upward
   with an initial velocity of 30 m/s and an initial height of 150 m.
   a. What is the speed of the body after 2 seconds?
   b. What is the height of the body after 2 seconds?
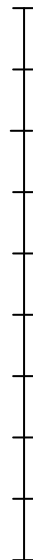
9. From the top of a tall building, a body (still not dead) is thrown downward with an initial velocity of 30 m/s
   and an initial height of 150 m.
   a. What is the speed of the body after 2 seconds?
   b. What is the height of the body after 2 seconds?

10. A student throws his worthless lab partner off a 120 m high bridge with an initial downward speed of 10 m/s.
    a. How long does it take the deadbeat to hit the ground below (hint: factor the quadratic)?
    b. How fast is he going at the moment of impact?