Name: Hr: AP Physics C Ch 2 - Worksheet 3

1. A projectile is fired horizontally from a height of 20 meters above the ground, with an initial velocity of 7.0 m/s. How far does the projectile travel horizontally before it reaches the ground?
    a. 7m
    b. 14m
    c. 140m
    d. 3.5m
    e. 20m

2. An object is launched into the air at an angle less than 90° above the surface of the earth. Air resistance is negligible. At the highest point in its path of motion, which of the following statements is true?
    a. It has no vertical velocity and no vertical acceleration.
    b. It has no horizontal velocity and no vertical acceleration.
    c. It has vertical velocity and no horizontal acceleration.
    d. It has horizontal velocity and no vertical acceleration.
    e. It has no vertical velocity and no horizontal acceleration.

3. A particle begins from rest at a point +10 meters from the origin at time t = 0, and begins accelerating at a constant 2 m/s2 in the negative direction. At time t = 4 seconds, the particle has reached a certain speed; it stops accelerating, and continues traveling with that same speed until t = 7 seconds. What is its position relative to the origin at t = 7 seconds?
    a. -6 meters
    b. -30 meters
    c. -8 meters
    d. -40 meters
    e. -59 meters

4. An object moving along the x-axis has its position given by the equation $x = 2.0\,t^2 - 3.0\,t + 4$, with x in meters and t in seconds. What is the acceleration of the object at time t = 4.0s?
    a. 24 m/s^2
    b. 46 m/s^2
    c. 13 m/s^2
    d. 16 m/s^2
    e. 4.0 m/s^2

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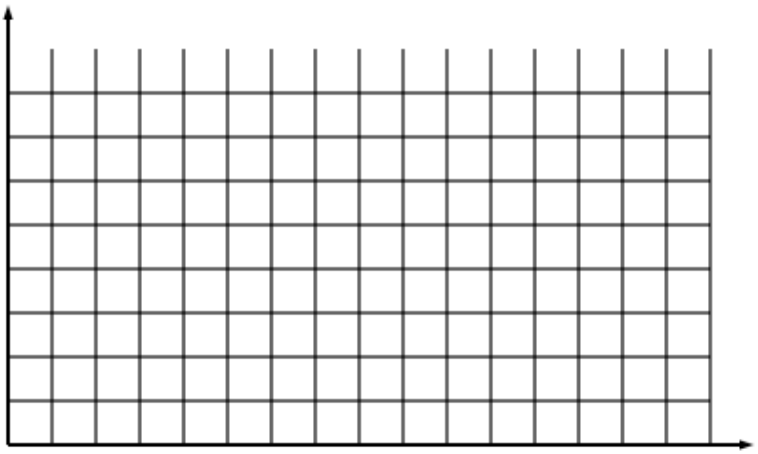
Part II. Free Response

5. A 50-gram superball is thrown horizontally in the negative-x direction against a brick wall so that it bounces directly back after hitting the wall. (The vertical motion of the ball during the throw is negligible.) The horizontal position of the ball's center of mass as a function of time is described in the data table below.

x-position relative to wall (centimeters)	25	20	15	10	6	3	2	3	6	10	14	18	22
t (milliseconds)	0	2	4	6	8	10	12	14	16	18	20	22	24

a. Draw a graph of the ball's position as a function of time.



b. Determine the ball's initial velocity before coming into contact with the wall?
c. Determine the ball's final velocity after bouncing off the wall?
d. What is the ball's average acceleration during the time period when the ball's velocity is changing, from 6 to 16 ms?

e. Use the graph to determine the ball's instantaneous velocity at time t = 10 ms. Explain briefly how you arrived at your answer.

6. A rocket, initially at rest, is fired vertically upward with an acceleration of 12.0 m/s2 . At an altitude of 1.00 km, the rocket engine cuts off. Air friction is negligible in this problem.

a. How fast is the rocket traveling when the engine cuts off?
b. What maximum height relative to the ground does the rocket reach before it begins falling back toward the earth?
c. After free-falling, what is the rocket's velocity just before it hits the earth?
d. For what total amount of time was the rocket in the air (from initial launch to return to earth)?

1.b 2.e 3.b 4.e
6 a- b.-25 m/s c. 20m/s d.4.5.e3 m/s^2 e.-8.3 m/s
7 a. 155m/s b.1225 m c.+/- 209 m/s d. 50S