

Arts & Science 2D06

Quiz #1 2006 Sept 22

Name:

NB: Mark values are given in brackets [] beside each problem. Write all your answers on the quiz paper. No books or notes allowed. Time to write quiz: 40 minutes.

Solution for quadratic equation: $x = (-b \pm \sqrt{b^2 - 4ac})/2a$

Uniform acceleration: $x = x_0 + v_0t + \frac{1}{2}at^2$ $v^2 = v_0^2 + 2a(x - x_0)$

1. [3] Stones A and B are thrown directly upward from the ground. A's initial speed is 3 times greater than B's. Which statement below is most nearly correct?

- (a) A takes 9 times longer than B to come back to the ground
- (b) A takes 3 times longer than B to come back to the ground
- (c) A takes $\sqrt{3}$ times longer than B to come back to the ground
- (d) A and B take the same time to go up and come down
- (e) A takes one-third as long as B to come back to the ground.

Now use the space below to *explain* your choice.

2. [2] A plane is flying at constant velocity as shown by the dashed line. It drops a mailbag at point P, and the bag lands on the ground a few seconds later. Which of the statements below is most nearly correct? (Ignore air resistance)

- (a) The bag lands directly below point P
- (b) When the bag lands, the plane is ahead of it
- (c) When the bag lands, the plane is directly above it
- (d) When the bag lands, it is ahead of the plane.

3. [5] The equation of motion of a particular projectile is given by

$$\mathbf{r}(t) = (6 t) \mathbf{i} + (6 t - 4.9 t^2) \mathbf{j}$$

(a) Where is it at $t = 0$?

(b) What is the equation for its velocity $\mathbf{v}(t)$? Write it using the unit vector \mathbf{i}, \mathbf{j} notation.

(c) What is its initial velocity \mathbf{v}_0 and "launch angle" θ ?

(d) If it is launched on level ground, where (x, y) does it land?

4. [5] A stone is thrown straight upward with a speed of 23 m/s. How much time does it take to reach a height of 12 meters above its 'launch' point?

5. [5] A ball thrown horizontally at $v_0 = 22$ m/s from the top of a building, lands 34 m from the base of the building. How high is the building?

[20] total marks