Department of Physics
**Physics 4A – Winter Quarter 2006**
Professor C. M. Surko

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You can pick up graded exams at the Physics Dept. Student Affairs window (Room 115, Urey Hall Addition) from 8 a.m.-4:30 p.m, Monday - Friday. The office is closed from 12 p.m. and 1 p.m. Please have your student ID with you.

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Potentially useful information:

$g = 9.8\ m/s^2$

$\vec{A} \cdot \vec{B} = A_x B_x + A_y B_y + A_z B_z$

If acceleration $a_x$ is constant, then:

$$v_x = v_{xo} + a_x t$$

$$x = x_o + v_{xo} t + \frac{1}{2} a_x t^2$$

$$v_x^2 = v_{xo}^2 + 2a_x (x - x_o)$$

If $a_y$ is a function of time, a(t), then:

$$v_y(t) = v_{yo} + \int_o^t a(t)dt$$

$$y(t) = y_o + \int_o^t v_y(t)dt$$

$a_c = -\omega^2 r = -v^2/r$

Fig. 1

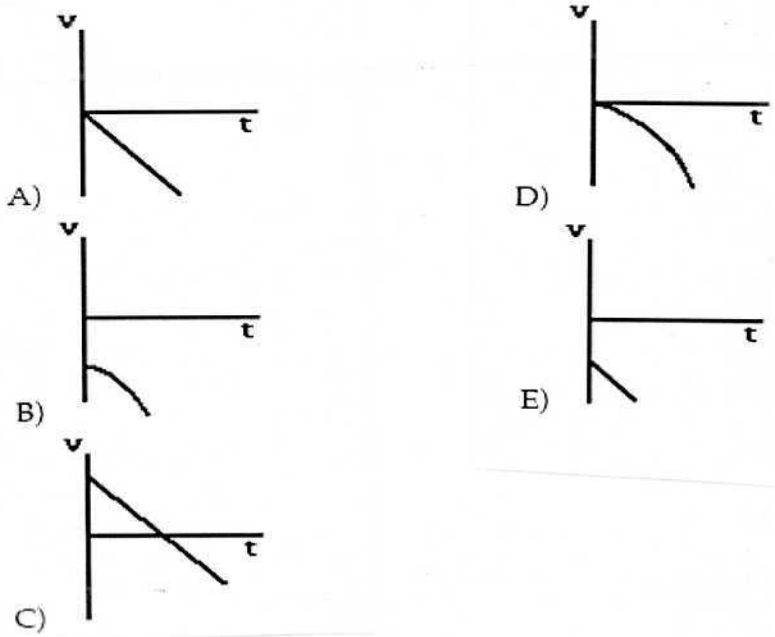


Fig. 2.

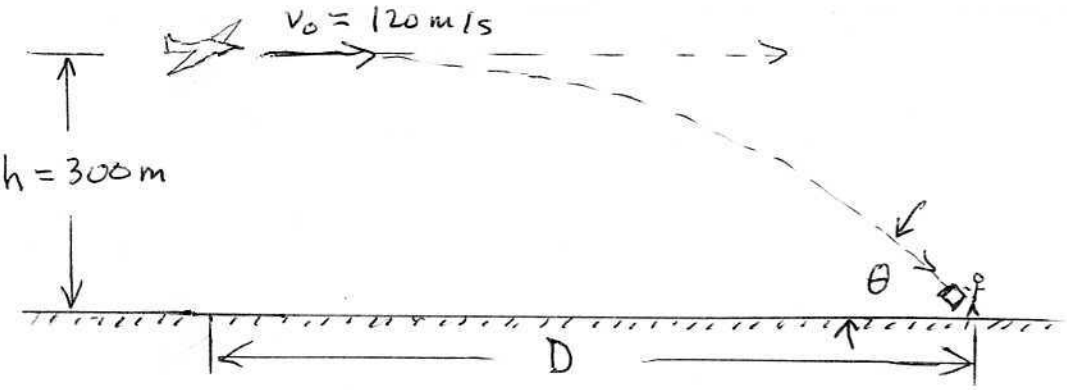
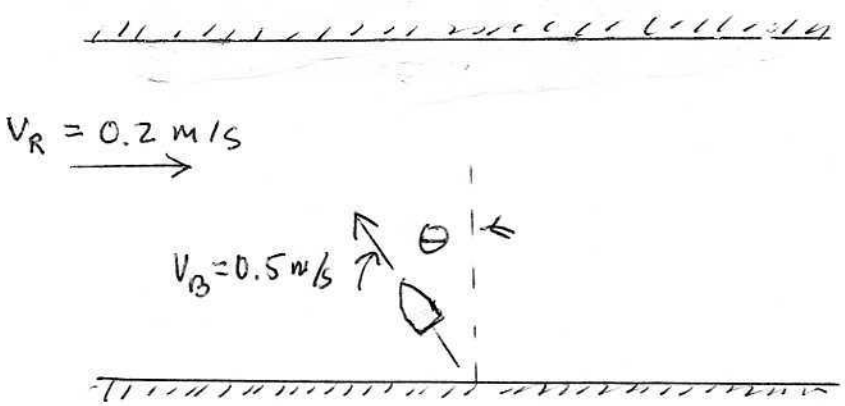



Fig 3.



Physics 4A Winter 2006 January 27, 2006
Professor C. M. Surko Quiz 1

Be sure to indicte your Code Number and the Test Form on the front of your Blue Book
The Test Form is indicated on the bottom of this page.

Please see preceeding page for potentially useful formulae. This exam contains 12 problems.

Problems 1 - 9, inclusive count 4 points each; and problems 10 - 12 count 8 points each.

Partial credit will be given for Problems 10 - 12, so please show your work clearly.

There will be no partial credit for problems 1 - 9.

Please put the answers to problems 1 - 9 on the first page inside your blue book.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

1) Of the following situations, for a given body, which is impossible?
   A) velocity directed east and acceleration west
   B) velocity east and acceleration east
   C) zero velocity and non-zero acceleration
   D) constant acceleration and variable velocity
   E) constant velocity and variable acceleration

2) The displacement of a particle can be obtained from
   A) the slope of an acceleration-time graph
   B) the slope of a velocity-time graph
   C) the area under an acceleration-time graph
   D) the area under a velocity-time graph
   E) the area under a position-time graph

3) A football is kicked, making a high, parabolic arc and then hits the ground. In this case its acceleration is
   A) downward during both ascent and decent
   B) downward during ascent and upward during decent
   C) upward during ascent and downward during descent
   D) upward during both ascent and descent
   E) downward except at the very top where it is zero

4) If the position of a particle (in m) is given by $x = 5 + 6t + 10t^2$, where t is the time in seconds, the <u>average</u> acceleration (in $m/s^2$) during the time interval, t: 0 - 4 s, will be
   A) - 12 B) + 8 C) + 20 D) - 4 E) - 16

5) This problem relates to Figure 1 on the formula pages. It plots velocity v as a function of time t, where v = 0 and t = 0 is at the intersection of the axes. A child standing on a bridge throws a rock straigth down with some initial velocity. The rock leaves the child's hand at t = 0. Which of the graphs shown best represents the velocity of the stone as a function of time?

A) Graph A B) Graph B C) Graph C D) Graph D E) Graph E

Situation I. Consider two vectors in three dimensions

$$\vec{A} = 6\hat{i} + 3\hat{j} + 8\hat{k} \text{ and } \vec{B} = 4\hat{j} - 5\hat{k},$$

where $\hat{i}$, $\hat{j}$, and $\hat{k}$ are the usual unit vectors.

6) In Situation I, the vector magnitude $\left|\vec{A} - \vec{B}\right|$ is approximately

A) 14 B) 9 C) 3 D) 7 E) 19

7) In Situation I, what is the dot product $\vec{A} \cdot \vec{B}$?

A) - 6 B) + 13 C) - 18 D) + 16 E) - 28

8) Consider two bullets fired uphill, parallel to an inclined plane. If the bullets have different masses and different initial velocities, which one will strike the plane in a shorter time?

A) The fastest one
B) The slowest one
C) The heaviest one
D) The lightest one
E) They will strike the plane after traveling the same length of time.

9) A ball on a string of length r = 0.5 m is twirled in a circle lying in a vertical plane. The speed of the ball is 3 m/s. In this case, at the bottom of the circle, the acceleration of the ball (in $m/s^2$) will be

A) 9 upward
B) 6 downward
C) 18 upward
D) 18 downward
E) 6 upward

**The following questions are not multiple choice. Please show your work in addition to the answer in your blue book.**

Situation II. This problem is illustrated in Figure 2 on the formula pages. A rescue plane in horizontal flight drops a package to stranded hikers on the ground. The plane is 310 m above the ground and traveling at a speed of 120 m/s.

10) In Situation II, at what horizontal distance, D, from the hikers should the plane release the package?

11) In Situation II, at what angle, $\theta$, to the horizontal does the package strike the ground?

12) This problem is illustrated in Figure 3 on the formula pages. A person in a row boat can row 0.50 m/s relative to the water and wants to go directly across a river flowing at a speed of 0.20 m/s, at what angle $\theta$ from the normal to the bank should he point the boat.

Answer Key
Testname: GF 1.II

1) E
2) D
3) A
4) C
5) E
6) A
7) E
8) E
9) C
10) No Correct Answer Was Provided.
11) No Correct Answer Was Provided.
12) No Correct Answer Was Provided.