SAMPLE TEST 1
PHYS 111, FALL 2013, SECTION 1

Name: _____

By writing my name above, I affirm that this test represents my work only, without aid from outside sources. In all aspects of this course I perform with honor and integrity.

SHOW YOUR WORK ON ALL OF THE PROBLEMS. YOUR APPROACH TO THE PROBLEM IS AS IMPORTANT AS, IF NOT MORE IMPORTANT THAN, YOUR ANSWER. DRAW **CLEAR AND NEAT PICTURES** SHOWING COORDINATE SYSTEMS AND ALL OF THE RELEVANT PROBLEM VARIABLES. ALSO, **EXPLICITLY** SHOW THE **BASIC EQUATIONS** YOU ARE USING. BE NEAT AND THOROUGH. THE EASIER IT IS FOR ME TO UNDERSTAND WHAT YOU ARE DOING, THE BETTER YOUR GRADE WILL BE.

1) (20pts) When we solve kinematics problems, we use two basic equations (one for velocity and one for position) that arise directly from the definitions of velocity and acceleration. Starting with the definitions of velocity and acceleration, derive these equations using calculus and **list any assumptions that were made.**

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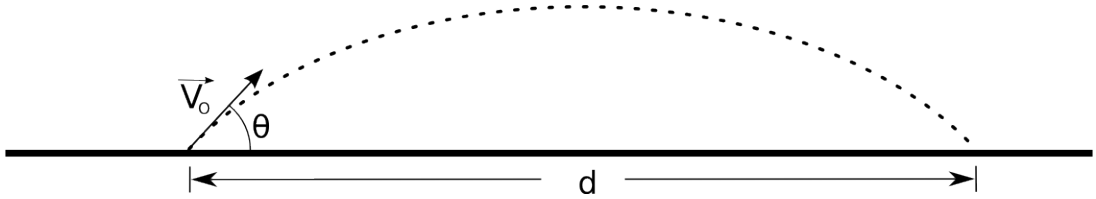
2. Short questions, 4 points each.

2.1 A projectile is fired with an initial velocity $|\vec{V}_O|$ at an angle θ as in the picture below.



Circle the correct expression for the x component of the projectile's velocity at the midpoint of its flight.

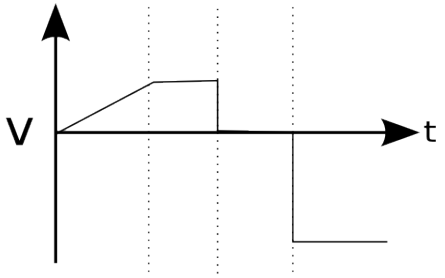
a) $V_x = |\vec{V}_o| \sin(\theta)$

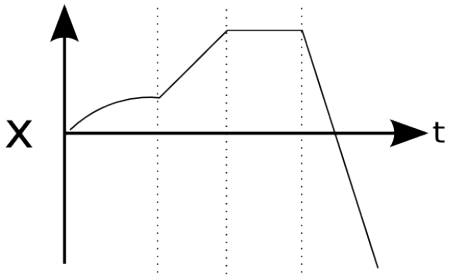
c) $V_x = |\vec{V}_o| \cos(\theta)$

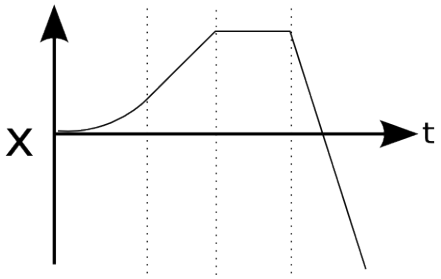
b) $V_x = 0$

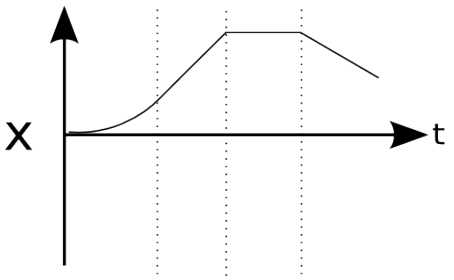
d) $V_x = \frac{1}{2} \frac{gd}{V_{oy}}$

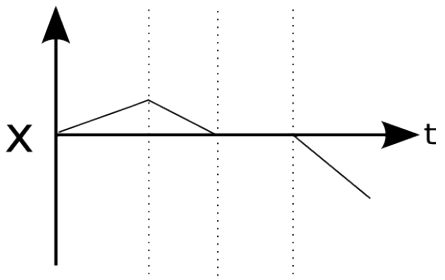
2.2) Circle the correct position versus time plot for the given velocity versus time plot.











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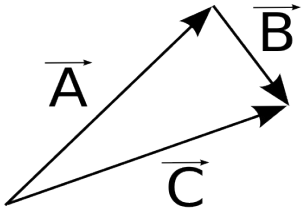
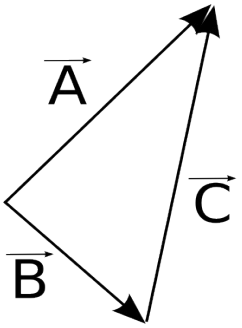
2.3 Which diagram correctly illustrates the vector equation $\vec{A}-\vec{B}=\vec{C}$

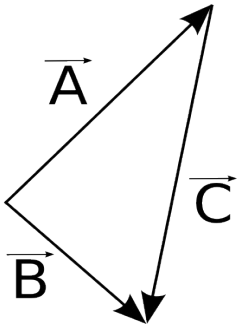
a)



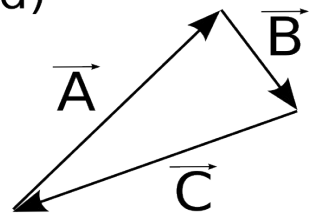
b)



c)



d)



2.4 If I throw a ball straight up, in the absence of air resistance, its velocity *vector* when it hits my hand is:

a) equal to the initial velocity vector
b) greater in magnitude than the initial velocity vector
c) equal in magnitude to the initial velocity vector but opposite in direction.
d) less in magnitude than the initial velocity vector

2.5 A projectile launched at an angle of 30^o (projectile A) has the same range as a projectile launched with the same initial velocity at an angle of 60^o (projectile B). Which of the following statements regarding their total flight time is true?

a) Projectile A has a longer flight time than Projectile B.
b) Projectile A has a the same flight time as Projectile B.
c) Projectile A has a shorter flight time than Projectile B.
d) Not enough information.

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3) It's Sunday afternoon and you have just arrived at the park with your dog Bowser. Ignoring the leash law, Bowser takes off chasing rabbits and squirrels. You started out together but soon part ways. Bowser chases a rabbit due south for 25 yards and then chases a squirrel along a line 10^{o} north of east for 30 yards. In the meantime, your leisurely stroll takes you to a point 10 yards north and 15 yards west of your starting point.

a) Find the x and y components of the displacement vector between you and Bowser.
b) Calculate the magnitude and direction of the vector you found in part a.

Extra space for #3

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4) Wily coyote has purchased a new dart gun that he plans to use on roadrunner. Being somewhat uncoordinated he accidentally fires the gun straight up. The gun was 0.50 m above the ground when it fired, the dart reached a maximum height of 50.50 m above the ground, and Wily is 1.00 m tall.

a) Find an *expression* for the Dart's INITIAL velocity. Plug in the numbers and find a numerical value.
b) Assuming that the initial velocity is given, find an *expression* for the dart's FINAL velocity as it hits him in the head. Plug in numbers and find a numerical value.

Extra Space for #4

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5) (30pts) Having recovered from an earlier crash, Gumby is ready to try new and more exciting stunts on his skateboard. After some prodding from the Blockheads, he decides to jump across a river. Gumby knows that the far bank is 3.0 m below the top of the ramp. The ramp is inclined at 37.0° above the x-axis. He is moving at 15 m/s when he leaves the ramp.

a. How wide of a river can Gumby jump if he puts the ramp on the edge of the riverbank?

b. If Gumby lands with $|\vec{v}|>16 m/s$ his legs will break. Does Gumby need crutches?

Extra Space for #5