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Name……
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Section:……

Physics for Engineers I
PHYS 191, Fall 2014
Exam 1
October 28, 2014

Please read the following instructions carefully before you start answering:

1. Make sure that you have **7** pages including two parts, A and B. Part A consists of 10 multiple choice questions, while Part B consists of 3 problems.
2. Answer all the questions and show all the steps of your work in part B in a clear tidy way.
3. Calculators are permitted but no electronic dictionaries.
4. Include units in all calculations and answers.
5. All your work must be done on your exam paper; no loose papers are allowed. If additional space is required use the last page and indicate that this has been done.
6. This is a timed exam (90 min). Do not spend too much time in any particular question.

Useful Information:

TABLE 3–1 Kinematic Equations for Constant Acceleration in 2 Dimensions

x Component (horizontal)		*y* Component (vertical)
$v_x = v_{x0} + a_x t$	(Eq. 2–12a)	$v_y = v_{y0} + a_y t$
$x = x_0 + v_{x0} t + \frac{1}{2} a_x t^2$	(Eq. 2–12b)	$y = y_0 + v_{y0} t + \frac{1}{2} a_y t^2$
$v_x^2 = v_{x0}^2 + 2a_x(x - x_0)$	(Eq. 2–12c)	$v_y^2 = v_{y0}^2 + 2a_y(y - y_0)$

Good Luck

Part A: *Please choose the correct answer for each question*

Question 1: (1 pt) What is, 34 + 3 × 1.2465, written with the correct number of significant figures?

A) 37.7
B) 37.74
C) 4×10^1
D) 38
E) 37.7395

Question 2: (1 pt) Which of the following is an accurate statement?

A) Rotating a vector about an axis passing through the tip of the vector does not change the vector.
B) The magnitude of a vector can be zero even though one of its components is not zero.
C) It is possible to add a scalar quantity to a vector.
D) The magnitude of a vector is independent of the coordinate system used.
E) Even though two vectors have unequal magnitudes, it is possible that their vector sum is zero.

Question 3: (1 pt) If $\vec{A}$ and $\vec{B}$ are nonzero vectors for which $\vec{A} \cdot \vec{B} = 0$, it must follow that:

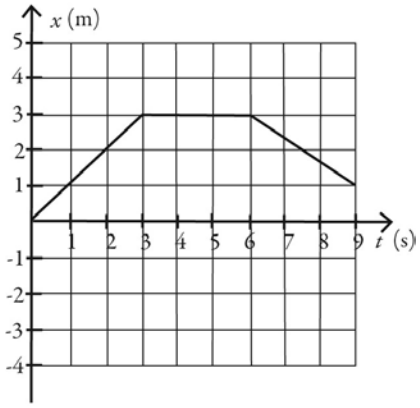
A) $\vec{A} \times \vec{B} = 0$.
B) $\vec{A}$ is parallel to $\vec{B}$.
C) $|\vec{A} \times \vec{B}| = AB$.
D) $|\vec{A} \times \vec{B}| = 1$.

Question 4: (1 pt) Vector $\vec{A} = -1.00\,\hat{\boldsymbol{i}} - 2.00\,\hat{\boldsymbol{j}}$ and vector $\vec{B} = 3.00\,\hat{\boldsymbol{i}} + 4.00\,\hat{\boldsymbol{j}}$. What are the magnitude and direction of vector $\vec{C} = 3.00\vec{A} + 2.00\vec{B}$?

A) 3.61 in a direction -56.3° counterclockwise from the positive *x*-axis
B) 3.61 in a direction 56.3° counterclockwise from the positive *x*-axis
C) 3.61 in a direction 33.7° counterclockwise from the positive *x*-axis
D) 5.00 in a direction 56.3° counterclockwise from the positive *x* axis
E) 6.72 in a direction 34.4° counterclockwise from the positive *x*-axis

Question 5: (1 pt) The figure shows the position of an object as a function of time. During the time interval from time $t = 0.0\ \text{s}$ and time $t = 9.0\ \text{s}$. The length of the path the object followed and the displacement of the object are, respectively:

A) -1.0 m, -1.0 m
B) 3.0 m, 9.0 m
C) 1.0 m, 3.0 m
D) 19.5 m, 3.9 m
E) 5.0 m, 1.0 m



Question 6: (1 pt) A ball is thrown directly upwards with a speed of 20 m/s. After 4 s, its velocity will be:

A) Zero
B) 0.4 m /s
C) -9.8 m /s
D) -19.2 m/s
E) none of the above

Question 7: (1 pt) The velocity of an object is given by the expression $v(t) = 3.00\ \text{m/s} + (4.00\ \text{m/s}^3)t^2$, where t is in seconds. Determine the position of the object as a function of time if it is located at $x = 1.00$ m at time $t = 0$ s.

A) $(4.00\ \text{m/s})t$
B) $(3.00\ \text{m/s})t + (1.33\ \text{m/s}3)t^3$
C) $1.00\ \text{m} + (3.00\ \text{m/s})t + (1.33\ \text{m/s}^3)t^3$
D) 1.33 m
E) $(4.00\ \text{m/s})t + 1.00\ \text{m}$

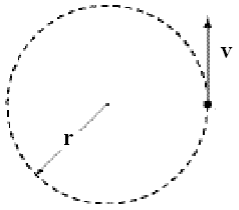
Question 8: (1 pt) Two objects are thrown from the top of a tall building and experience no appreciable air resistance. One is thrown up, and the other is thrown down, both with the same initial speed. What are their speeds when they hit the street?

A) The one thrown up is traveling faster.
B) The one thrown down is traveling faster.
C) They are traveling at the same speed.
D) None of the above.
E) All the above.

Question 9: **(1 pt)** A pilot drops a package from a plane flying horizontally at a constant speed. Neglecting air resistance, when the package hits the ground the horizontal location of the plane will

A) be behind the package.
B) be over the package.
C) be in front of the package.
D) depend of the speed of the plane when the package was released.
E) None of the above.

Question 10: **(1 pt)** An object moving with constant speed *v* on a circle of radius *r* has acceleration a_c . If *v* is doubled, the new acceleration will be



A) 0.5 a_c
B) a_c
C) 2 a_c
D) 4 a_c
E) None of the above

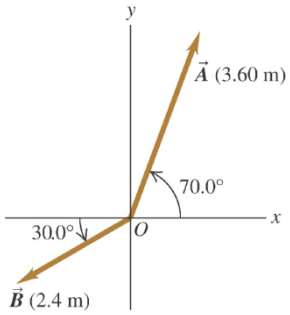
Part B: *Please solve the following problems showing all the steps of your solutions.*

Problem 1: (3 pts) Two vectors $\vec{A}$ and $\vec{B}$ are shown in the figure below. (use 3FS)

a) Write the two vectors in vector-unit form?

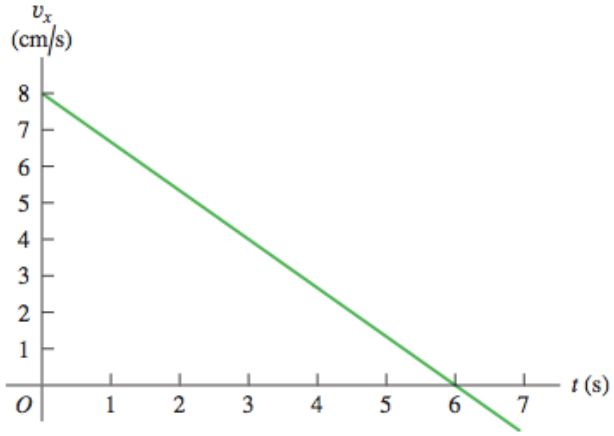
b) Determine their scalar product?

c) Determine their cross product?



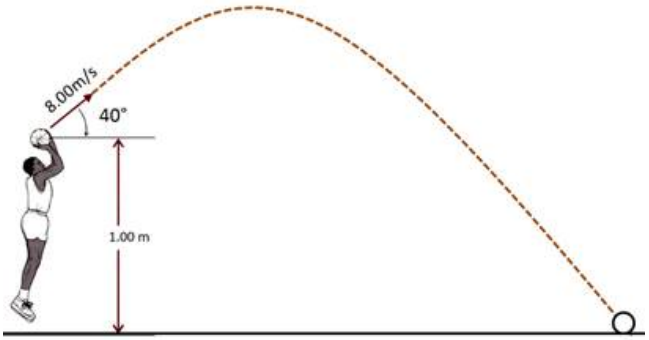
Problem 2: **(3 pts)** A cat walks in a straight line, which we shall call the *x*-axis with positive direction to the right. As an observant physicist, you make measurements of this cat's motion and construct a graph of the velocity as of function of time (figure below).

a) Find the cat's velocity at t = 4.0 sec and t = 7.0 sec.
b) What is the cat's acceleration at t = 3.0 sec.
c) Calculate the cat's velocity t = 10 sec.
d) What displacement does the cat move between the time t = 0 s and t = 4.0 s?



Problem 3: **(4 pts)** A child throws a ball with an initial speed of 8.00 m/s at an angle of 40.0° above the horizontal. The ball leaves her hand 1.00 m above the ground and experience negligible air resistance.

a) What is the total time for the ball in the air?
b) What is the maximum high of the ball in the air relative to ground?
c) What is the velocity just before it hits the ground, write your answer in unit vector notation?
d) How far did the ball traveled before it hits the ground?



End of Exam