Physics 2211 BCD Test form **411** Name _____
Spring 2015
Test 1 Recitation Section (see back of test):_____

A

1) Print your name, test form number (above), and nine-digit student number in the section of the answer card labeled "STUDENT IDENTIFICATION".

2) Bubble your test form number (**ABOVE**) in columns 1-3, skip column 4, then bubble in your student number in columns 5-13.

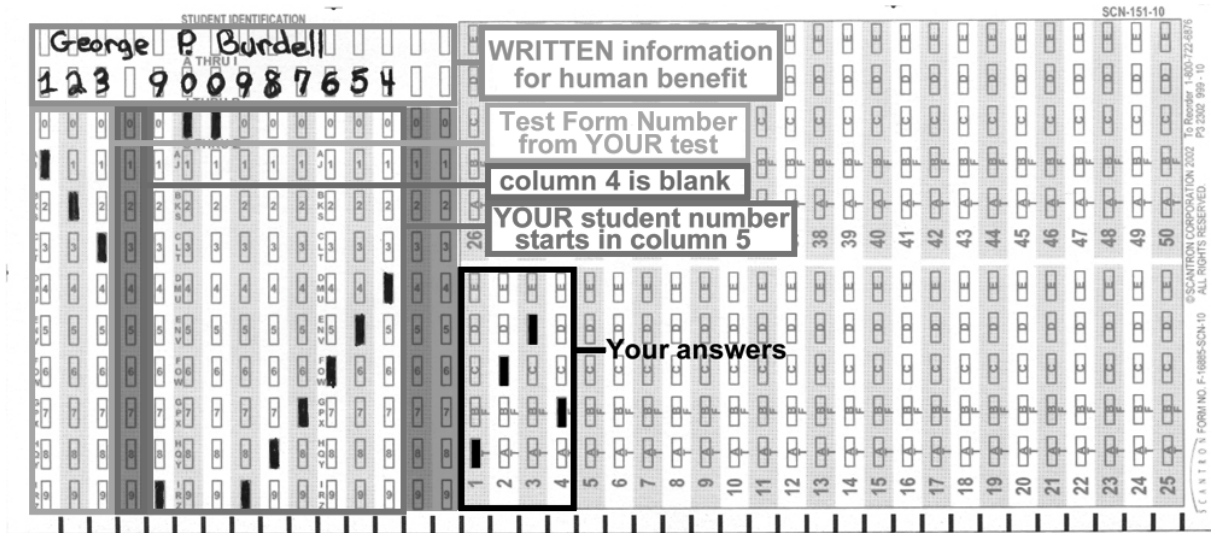
3) For each free-response question, show all relevant work supporting your answer. **Clearly box or underline your final answer.** "Correct" answers which are not supported by adequate calculations and/or reasoning will be counted wrong.

4) For each multiple-choice question, select the answer most nearly correct, **circle this answer on your test**, and bubble it in on your answer card. **Show all relevant work on your quiz.**

5) Be prepared to present your Buzzcard as you turn in your test. Scores will be posted to WebAssign after they have been been graded. **Quiz grades become final when the next quiz is given.**

6) You may use a simple scientific calculator capable of logarithms, exponentials, and trigonometric functions. **Programmable engineering calculators with text or graphical capabilities are not allowed. Wireless devices are prohibited.**

Your test form is: 411



Our next test will be on Monday, February 16!

The following problem will be hand-graded. Show all your work for this problem. Make no marks and leave no space on your answer card for it.

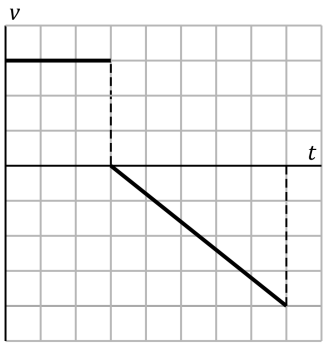
[I] A rocket is fired from rest, starting at ground level. While the rocket motor is on, the rocket experiences an upward acceleration of magnitude $a_{up} = 2g$. (This is the net acceleration, after the effects of gravity have been taken into account.) After reaching a height h above ground, the rocket motor cuts off.

(A) *(10 points)* Find an expression for the maximum height H reached by the rocket. Express your answer as a multiple of h.

(B) *(10 points)* Suppose that the rocket's motor cut-off occurs at a height h = 1250 m. For what total time Δt_{TOT} will the rocket be airborne (i.e. including its powered ascent, its free-fall ascent, and its free-fall descent)?

The following problem will be hand-graded. *Show all your work for this problem.* *Make no marks and leave no space on your answer card for it.*

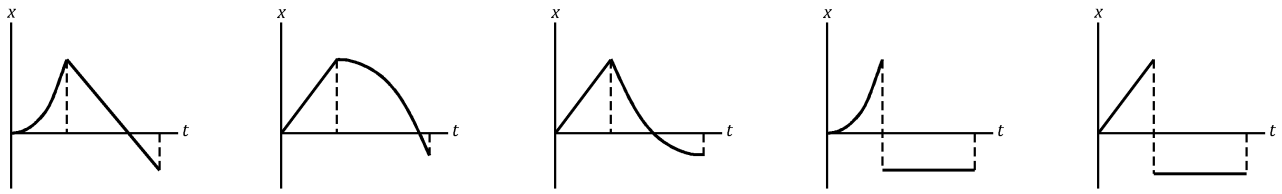
[II] The graph at right displays the velocity-vs-time plot for a particle moving in one dimension. Each vertical unit on the graph corresponds to 5.0 m/s of velocity, and each horizontal unit of the graph corresponds to 5.0 seconds of elapsed time.



(15 points) Determine the average velocity of the particle over the full 40-second interval displayed in the plot.

Question value 5 points — mark your answer in space #1 on the answer card.

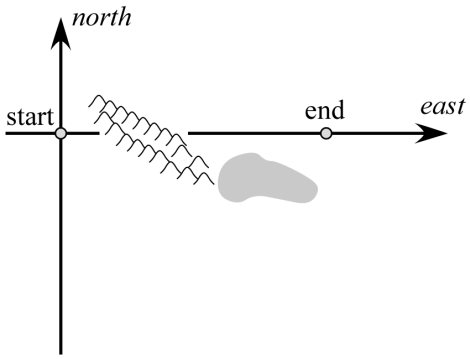
(1) Which of the five plots below best represents the x-vs-t graph for the particle?



(a) (b) (c) (d) (e)

The following problem will be hand-graded. Show all your work for this problem. Make no marks and leave no space on your answer card for it.

[III] You are hiking cross-country, aiming for a wilderness campsite that is a distance D =12 km due east of your starting point. A difficult, rocky ridge blocks your direct path, so you start by traveling in a direction θ_1 = 23° south of east. After travelling a distance d_1 = 9.0 km, you turn and travel in a direction θ_2 = 33° north of east. After travelling d_2 = 4.0 km, you find your way blocked by an impassable swamp. You travel due east (θ_3 = 0.0°) along the edge of the swamp for d_3 = 2.0 km, at which point you reach a clearing and the swamp ends.



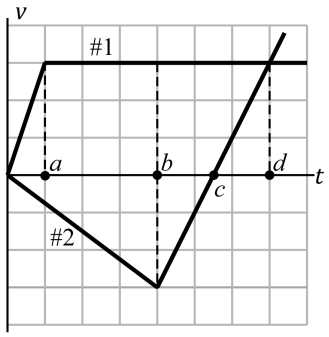
(15 points) What displacement will take you directly from the clearing at end of the swamp to the campsight?

Question value 5 points — mark your answer in space #2 on the answer card.

(2) Compare your average speed during the trip, v_{av}, to the magnitude of your average velocity during the trip, $|\vec{v}_{\text{av}}|$.

(a) It must be true that $v_{\text{av}} = |\vec{v}_{\text{av}}|$.
(b) It might be true that $v_{\text{av}} < |\vec{v}_{\text{av}}|$.
(c) It must be true that $v_{\text{av}} < |\vec{v}_{\text{av}}|$.
(d) It must be true that $v_{\text{av}} > |\vec{v}_{\text{av}}|$.
(e) It might be true that $v_{\text{av}} > |\vec{v}_{\text{av}}|$.

Two cars move along the x-axis, with the velocities plotted as functions of time in the graph at right. Car #1 starts at initial position $\vec{x}_{1i} = \langle 0 \rangle$, and Car #2 starts at initial position $\vec{x}_{2i} = \langle -D \rangle$.



Question value 5 points

(3) At which of the times indicated in the graph will Car #2 *first* begin to reduce its distance from Car #1?

(a) At time *a*.

(b) At none of the times shown in the plot.

(c) At time *b*.

(d) At time *c*.

(e) At time *d*.

Question value 5 points

(4) At which of the times indicated in the graph will Car #2 *overtake* Car #1?

(a) At none of the times shown in the plot.

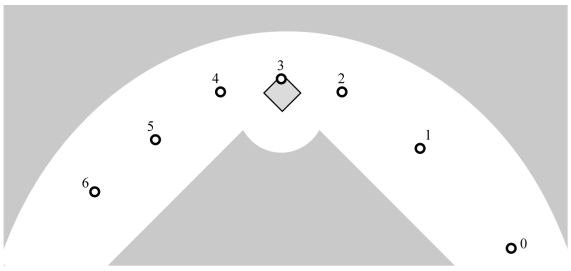
(b) At time *d*.

(c) At time *a*.

(d) At time *b*.

(e) At time *c*.

The motion diagram at right portrays a baseball player rounding second base, as seen from directly above. Please use this diagram to answer the four questions below.



Question value 5 points

(5) During what two intervals is the baserunner *gaining* speed?

(a) Between frames 4 and 6.
(b) Between frames 2 and 4.
(c) Between frames 3 and 5.
(d) Between frames 0 and 2.
(e) Between frames 1 and 3.

Question value 5 points

(5) During what two intervals does the baserunner experience negative acceleration?

(a) Between frames 0 and 2.
(b) Between frames 2 and 4.
(c) There is no valid answer to this question.
(d) Between frames 1 and 3.
(e) Between frames 3 and 5.

Question value 5 points

(7) During what two intervals is the baserunner's velocity most nearly constant?

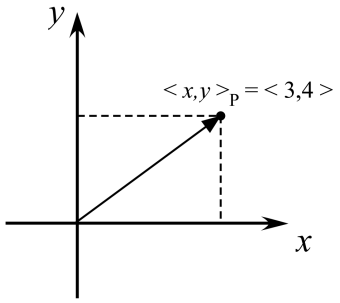
(a) Between frames 4 and 6.
(b) Between frames 2 and 4.
(c) Between frames 1 and 3.
(d) Between frames 0 and 2.
(e) Between frames 3 and 5.

Question value 5 points

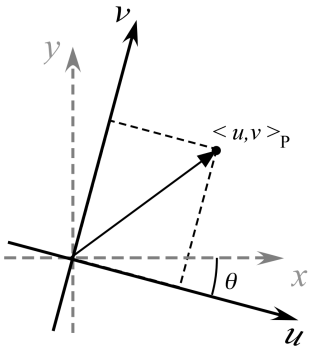
(8) Which of the arrows below best characterizes the direction of the baserunner's *acceleration* at point 2 ?

(a) (b) (c) (d) (e)

Point P is located at coordinates $\langle x, y\rangle = \langle +4.00\text{ cm}, +3.00\text{ cm}\rangle$ (top right). A second, rotated coordinate system is established—the *uv*-axes, which have been rotated by and angle $\theta = 16.2°$ clockwise from the *xy*-axes (bottom right).



It may not appear that the position vector $\vec{r}_P$ is the same in both figures, but it is!



Question value 5 points

(9) What is the *u*-coordinate of the same point P?

(a) $\vec{r}_u = \langle +3.84\text{ cm}\rangle$

(b) $\vec{r}_u = \langle +3.00\text{ cm}\rangle$

(c) $\vec{r}_u = \langle +4.23\text{ cm}\rangle$

(d) $\vec{r}_u = \langle +3.72\text{ cm}\rangle$

(e) $\vec{r}_u = \langle +4.80\text{ cm}\rangle$

Question value 5 points

(10) What is the *v*-coordinate of the same point P?

(a) $\vec{r}_v = \langle +4.00\text{ cm}\rangle$

(b) $\vec{r}_v = \langle +2.88\text{ cm}\rangle$

(c) $\vec{r}_v = \langle +3.12\text{ cm}\rangle$

(d) $\vec{r}_v = \langle +3.57\text{ cm}\rangle$

(e) $\vec{r}_v = \langle +2.40\text{ cm}\rangle$

PHYS 2211 BCD Recitation TA and Room Assignments

Tests will be returned in recitation, in the week *after* the test. In order to ensure that you receive your test back as soon as possible, please enter your recitation section from the table above on the front of this test.

	Clough 123	Clough 125	Clough 127	Clough 131	Clough 325
MONDAY					
2:05 – 2:55 pm				B01 Greenway, Lucas	B05 Baker, Caitlin
3:05 – 3:55 pm				B02 Greenway, Lucas	C02 Eswar, Aditya
4:05 – 4:55 pm	C01 Eswar, Aditya			B06 Greenway, Lucas	
TUESDAY					
1:05 – 1:55 pm					C04 Liberi, Brandon
2:05 – 2:55 pm		D02 Zhou, Jiarun		C03 Baker, Caitlin	
3:05 – 3:55 pm					B04 Strauss, Hunter
4:05 – 4:55 pm					B03 Strauss, Hunter
5:05 – 5:55 pm	C09 Eswar, Aditya			D04 Strauss, Hunter	
WEDNESDAY					
1:05 – 1:55 pm		B09 Ravipati, Akshay			
2:05 – 2:55 pm		D01/D05 Liberi, Brandon			
3:05 – 3:55 pm			C05 Ravipati, Akshay		
4:05 – 4:55 pm			C06/D06 Eswar, Aditya		
THURSDAY					
2:05 – 2:55 pm				B08 Zhou, Jiarun	C07 Baker, Caitlin
3:05 – 3:55 pm			B07 Tao, Liangyu		D07 Baker, Caitlin
4:05 – 4:55 pm			C08/D03 Tao, Liangyu		
5:05 – 5:55 pm					
6:05 – 6:55 pm			C10/D09 Tao, Liangyu		