Physics 2101, First Exam, Spring 2007

January 25, 2007

Name : _____

Section: (Circle one)

1 (Rupnik, MWF 7:40am)	2 (Giammanco, MWF 9:40am)
3 (Rupnik, MWF 11:40am)	4 (Rupnik, MWF 2:40pm)
5 (Giammanco, TTh 10:40am)	6 (González, TTh 1:40pm)

- Please be sure to write your name and circle your section above.
- For the problems, you *must* show all your work. Let us know what you were thinking when you solved the problem! Lonely right answers will not receive full credit, lonely wrong answers will receive no credit.
- For the questions, no work needs to be shown (there is no partial credit).
- Please carry units through your calculations when needed, lack of units will result in a loss of points.
- You may use scientific or graphing calculators, but you must derive your answer and explain your work.
- Feel free to detach, use and keep the formula sheet. No other reference material is allowed during the exam.
- Be sure to get extra credit by answering the question below.
- **GOOD LUCK!**

EXTRA CREDIT (5 pts):

Did you take Physics 1100 during the fall semester of 2006? Yes No

If you responded "yes", then please circle your grade if you remember it. A B C D

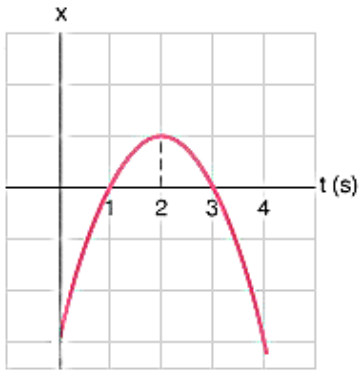
Did you place out of Physics 1100 during spring testing? Yes No

Have you taken Physics 2101 at LSU before? Yes No

If you responded "yes", then how many times before have you taken Phys 2101? _____

Question 1 - 11 Points

The figure shows the position of a particle moving along the $x-$axis, as a function of time.



(a) (3 pts) What is the direction of travel at t=0?

Forward $(+x)$ Backward $(-x)$ The particle is stopped

(b) (4 pts) At what time does the particle reverse its direction of travel?

t=0s t=1s t=2s t=3s The particle always moves in the same direction

(c) (4 pts) What is the sign of the acceleration?

Positive

Negative

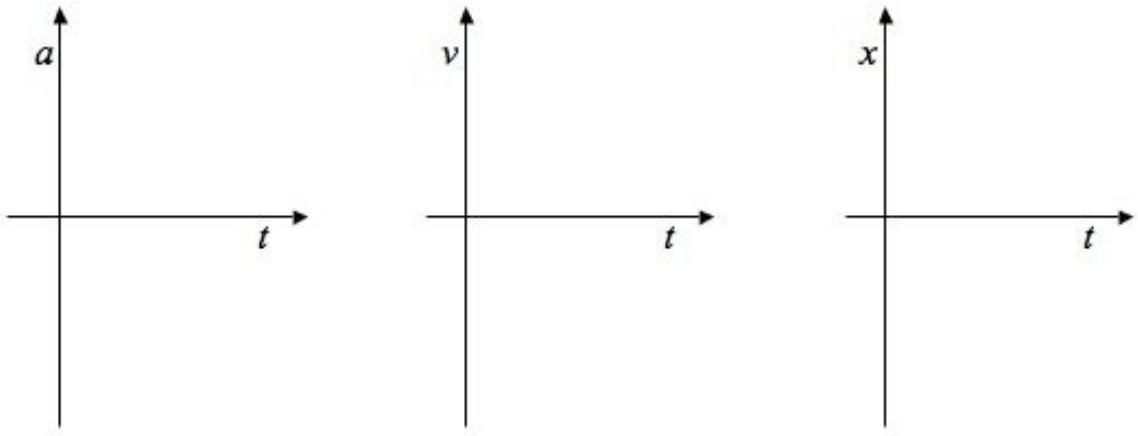
The acceleration is zero

The acceleration has different signs at different times

Problem 1 - 22 points

An elevator cab accelerates up from rest with a constant acceleration a, and then it decelerates back to rest with a constant acceleration of the same magnitude.

(a) (8 pts) Sketch the acceleration, velocity and position of the elevator as a function of time, assuming that it starts moving at t=0.

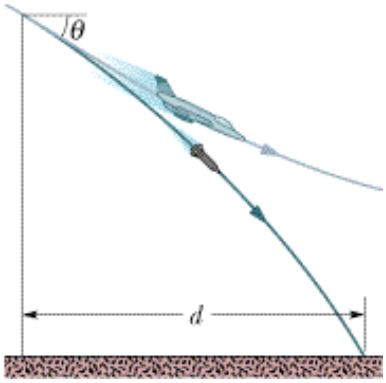


(b) (6 pts) The elevator obtains a maximum velocity equal to v_{max}. How long does the elevator take to obtain this velocity? (Hint: you may want to identify this point in your plot for velocity in part (a)). Express your answer in terms of a and v_{max}.

(c) (8 pts) What's the distance traveled by the elevator by the time it is back at rest? Express your answer in terms of a and v_{max}.

Problem 2 - 22 points

An airplane has a speed of 300 km/h and is diving at an angle of $\theta = 30°$ below the horizontal when the pilot releases a radar decoy. The horizontal distance between the release point and the point where the decoy strikes the ground is d =700m.



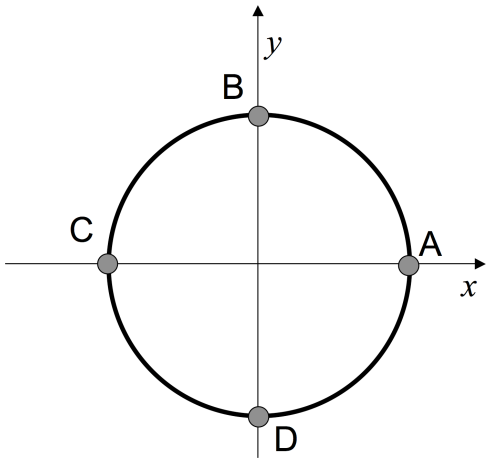
(a) (8pts) How long is the decoy in the air?

(b) (7 pts) How high was the release point?

(c) (7 pts) What is the speed of the decoy just before it hits ground?

Question 2 - 11 points

The particle P in the figure is in uniform circular motion, centered in the origin of an xy coordinate system. At a certain point in the particle's motion, the particle is at $x = -5\text{m}$, and its velocity is $-10(\text{m/s})\hat{j}$.



(a) (3 pts) Which of the four points marked in the figure is it?

A B C D None of the points marked

(b) (4 pts) What's the velocity of the particle at $y = +5\text{m}$?

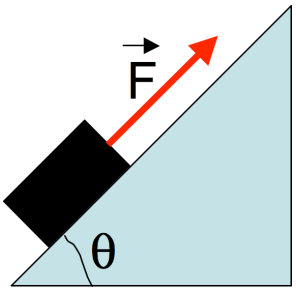
$10(\text{m/s})\ \hat{i}$ $10(\text{m/s})\ \hat{j}$ $-10(\text{m/s})\ \hat{i}$ $-10(\text{m/s})\ \hat{j}$

(c) (4 pts) What's the acceleration of the particle at $y = +5\text{m}$?

$20\text{m/s}^2\ \hat{j}$ $-20\text{m/s}^2\ \hat{j}$ $100\text{m/s}^2\ \hat{j}$ $-100\text{m/s}^2\ \hat{j}$ None of these.

Question 3 - 11 points

The figure shows a block of mass m on a ramp. There is a friction force between the block and the ramp. There is also an external force $\vec{F}$ directed up the ramp.



Initially, the external force $\vec{F}$ is zero, and the block is held stationary on the ramp by friction.

(a) (3pts) What is the magnitude of the friction force?

0 $\quad mg$ $\quad \mu_k F_N$ $\quad \mu_s F_N$ $\quad mg\cos\theta$ $\quad mg\sin\theta$

(b) (3pts) What is the direction of the friction force?

$\rightarrow$ $\quad \leftarrow$ $\quad \nearrow$ $\quad \swarrow$ $\quad \uparrow$ $\quad \downarrow$

Now the force $\vec{F}$ is increased, and the block is moving up the incline.

(c) (3pts) What is the magnitude of the friction force now?

mg $\quad \mu_k F_N$ $\quad \mu_s F_N$ $\quad mg\cos\theta$ $\quad mg\sin\theta$

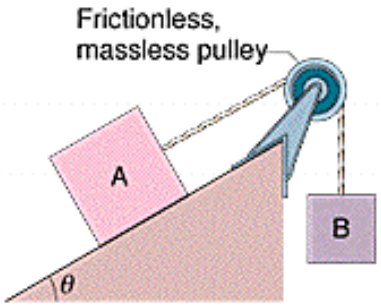
(d) (2pts) What is the direction of the friction force now?

$\rightarrow$ $\quad \leftarrow$ $\quad \nearrow$ $\quad \swarrow$ $\quad \uparrow$ $\quad \downarrow$

Problem 3 - 23 points

Two blocks are connected over a pulley, as shown in the figure. Block A has a 10kg mass, and block B has a 5kg mass. The angle of the incline is $\theta = 40°$. Block A is moving down the rough incline with *constant speed* equal to 0.5m/s.

(a) (6 pts) Draw a free body diagram for *each* of the masses.



(b) (4 pts) What is the tension in the cord?

(c) (5 pts) What is the normal force of the incline on block A?

(d) (8 pts) What is coefficient of kinetic friction between block A and the incline?