Name: _____ Total Points: _____
(Last) (First)

Physics 201

Exam 2

Write also your name in the appropriate box of the scantron

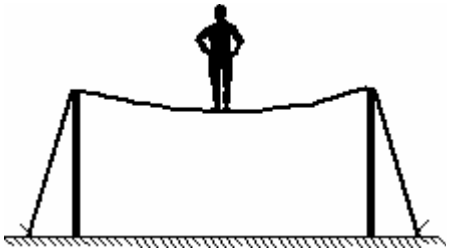
Name: _____ Total Points: _____
(Last) (First)

Multiple choice questions [60 points]

Answer all of the following questions. Read each question carefully. **Fill the correct bubble on your scantron sheet**. Each question has exactly one correct answer. All questions are worth the same amount of points.

1. A car travels east at constant velocity. The net force on the car is:
- **A.** east
- **B.** west
- **C.** up
- **D.** down
- **E.** zero

2. A circus performer of weight *W* is walking along a "high wire" as shown. The tension in the wire is:



Hint: Draw a free body diagram for the circus performer.

- **A.** approximately *W*
- **B.** approximately *W*/2
- **C.** much less than *W*
- **D.** much more than *W*
- **E.** depends on whether he stands on one or two feet

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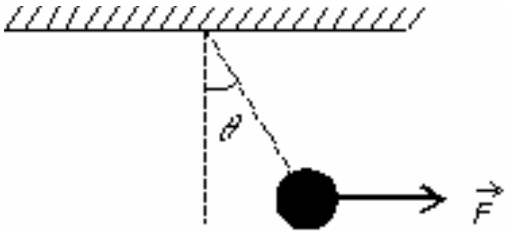
3. A 1-N pendulum bob is held at an angle θ from the vertical by a 2-N horizontal force F as shown. The tension in the string supporting the pendulum bob (in newtons) is:



A. $\cos \theta$
B. $2/\cos \theta$
C. $\sin \theta$
D. $\tan \theta$
E. $\sqrt{5}$

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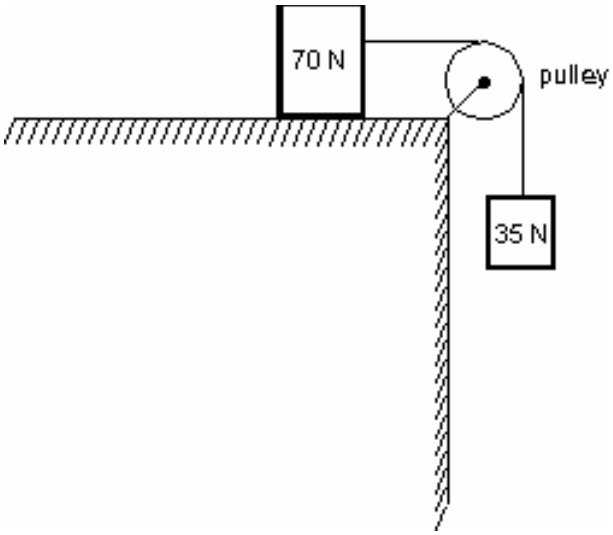
4. A 70 N block and an 35-N block are connected by a string as shown. If the pulley is massless and the surface is frictionless, the magnitude of the acceleration of the 70-N block is:



(Recall the similar computation done in lab)

A. $1.6\ m/s^2$
B. $3.3\ m/s^2$
C. $4.9\ m/s^2$
D. $6.7\ m/s^2$
E. $9.8\ m/s^2$

5. A horizontal shove of at least 200-N is required to start moving a 800-N crate initially at rest on a horizontal floor. The coefficient of static friction is:

A. 0.25
B. 0.125
C. 0.50
D. 0.75
E. 1.00

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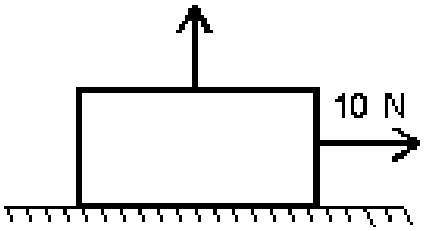
6. A box with a weight of 50 N rests on a horizontal surface. A person pulls horizontally on it with a force of 10 N and it does not move. To start it moving, a second person pulls vertically upward on the box. If the coefficient of static friction is 0.4, what is the smallest vertical force for which the box moves?



A. **4 N**
B. **10 N**
C. **14 N**
D. **25 N**
E. **35 N**

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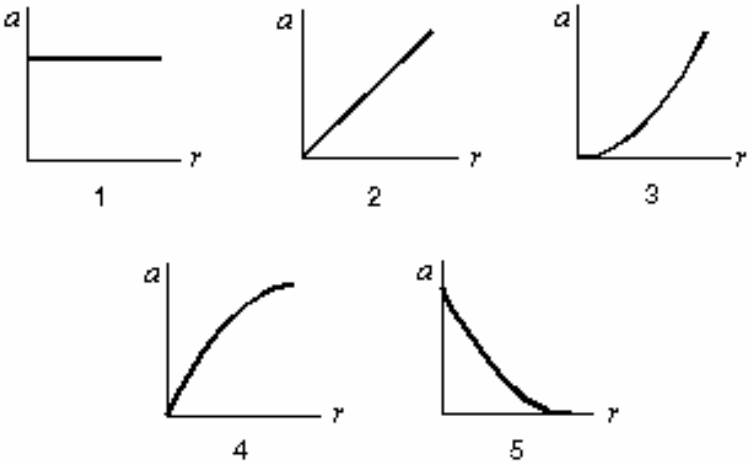
7. Which of the following five acceleration versus radius graphs is correct for a particle moving in a circle of radius *r* with acceleration *a* at a constant speed of 10 m/s?



A. 1
B. 2
C. 3
D. 4
E. 5

8. A person riding a Ferris wheel is strapped into her seat by a seat belt. The wheel is spun so that the centripetal acceleration is *g*. Select the correct combination of forces that act on her when she is at the top. In the table, W_{PE} = weight, down; F_{PB} = seat belt force, down; and F_{PS} = seat force, up.

A. $W_{PE} = 0,\ F_{PB} = mg,\ F_{PS} = 0$
B. $W_{PE} = mg,\ F_{PB} = 0,\ F_{PS} = 0$
C. $W_{PE} = 0,\ F_{PB} = 0,\ F_{PS} = mg$
D. $W_{PE} = mg,\ F_{PB} = mg,\ F_{PS} = 0$
E. $W_{PE} = mg,\ F_{PB} = 0,\ F_{PS} = mg$

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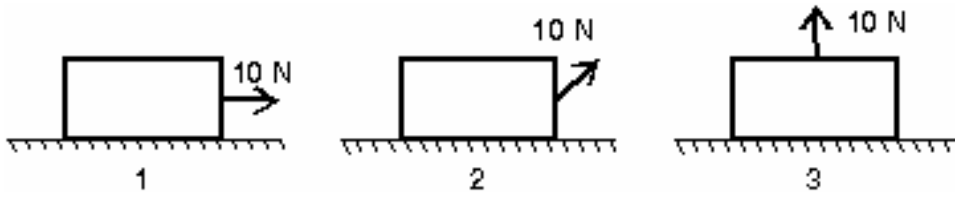
9. A crate moves to the right on a horizontal surface as a woman pulls on it with a 10-N force. Rank the situations shown below according to the work done by the 10-N force, least to greatest. The displacement is the same for all cases.



A. 3, 2, 1
B. 2, 1, 3
C. 2, 3, 1
D. 1, 3, 2
E. 1, 2, 3

10. A man pulls a sled along a rough horizontal surface by applying a constant force $\vec{F}$ at an angle θ above the horizontal. In pulling the sled a horizontal distance *d*, the work done by the man is:

A. Fd
B. $Fd \cos \theta$
C. $Fd \sin \theta$
D. $Fd/\cos \theta$
E. Can't tell without knowing the coefficient of kinetic friction.

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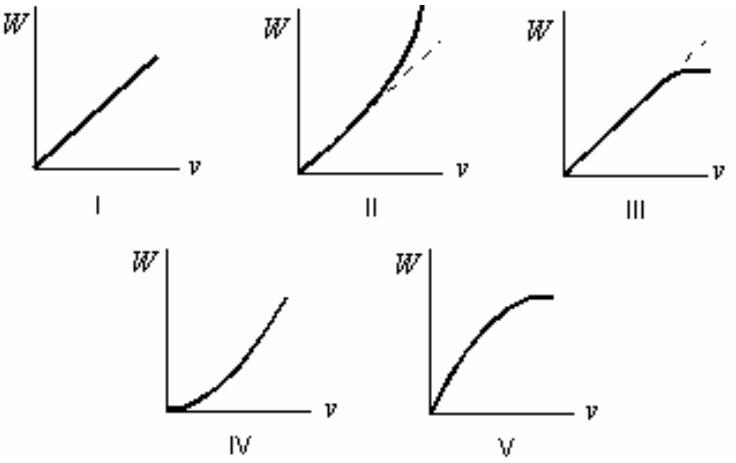
11. A particle is initially at rest on a horizontal frictionless table. It is acted upon by a constant horizontal force *F*. Which of the following five graphs is a correct plot of work W as a function of particle speed *v*?



Hint: use the work energy theorem

A. I
B. II
C. III
D. IV
E. V

12. The velocity of a particle moving along the *x* axis changes from v_i to v_f. For which values of v_i and v_f is the total work done on the particle negative?

A. $v_i = 2\text{m/s}$, $v_f = 5\text{m/s}$
B. $v_i = -2\text{m/s}$, $v_f = 5\text{m/s}$
C. $v_i = -5\text{m/s}$, $v_f = 2\text{m/s}$
D. $v_i = 2\text{m/s}$, $v_f = -5\text{m/s}$
E. $v_i = -2\text{m/s}$, $v_f = -5\text{m/s}$

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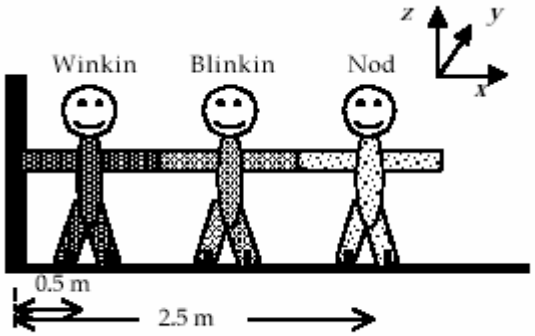
PROBLEM [40 points]



Winkin, Blinkin, and Nod are identical triplets, each having a mass m = 30.0 kg. They clasp arms in a line and go out on to an ice-covered pond.
Winkin grabs onto a post anchored in the ice with his free arm, and starts to go around the post. He soon reaches a constant speed, where he makes one complete revolution in a time T = 6.28 s.

The distance from the center of each boy to the end of his arm is 0.50 m, so that Nod's body is 2.5 m from the post and Blinkin's body is 1.5 m from the post. At the instant shown, the boys are lined up along the x-axis ($\hat{i}$), and skating at constant speed in the negative y direction ($-\hat{j}$, out of the page). The z-axis ($\hat{k}$) is vertical.

1). [10 pts] If the boys' arms stay rigid, what is Nod's velocity as he goes around the post? Measure his velocity at the center of his body which is 2.5 m from the post. Give the direction, units and magnitude. Explain.

2). [10 pts] What is Nod's acceleration vector at the instant shown (direction, units, and magnitude). Explain.

3). [15 pts]What is the force $\vec{F}_{BN}$ the force with which Nod pulls on Blinkin? Give the direction, units and magnitude. Explain.

4). [10 pts] What is the force $\vec{F}_{BW}$ the force with which Winkin pulls on Blinkin? Give the direction, units and magnitude. Explain.