

**Phy131 Third Homework Assignment**  
**Due Wednesday April 23**

**Do any 5 of the 8 problems, since the assignment is due Wednesday.**

*Figures for the questions can be found the the last page of the assignment*

**Question 1.**

A ball is thrown **horizontally** from a cliff that is 64 feet high. when the ball hits the ground, its speed is twice its initial speed. What is it's initial speed in units of ft/sec?

**Question 2**

Captain Hertica of the Coast Guard wants to hit a target with the ship's gun. The target, a big balloon in the water, is located a horizontal distance of 100 feet from the ship. The gun is located at the edge of the ship and is 35 feet above the water. The captain wants the projectile to hit the target exactly 5 seconds after it is shot.

At what angle, and with what velocity should the projectile be shot?

**Question 3**

Shaquille, who weighs 300 pounds, wants to swing on a swing in the neighborhood playground. The swing has two ropes, each of length 10 feet. Each rope attached to the swing can withstand a force of 200 pounds before breaking. What is the maximum speed at the bottom of the swing that Shaquille can have without breaking the ropes?

**Question 4**

A block slides down an inclined plane. The plane makes an angle of  $30^\circ$  with the horizontal. If the acceleration of the block down the plane is  $g/3$ , what is the coefficient of friction between the block and the surface of the plane?

**Question 5**

Ellie wants to ride her bike over the canyon shown in the figure on the last page. The edge that she rides off is 100 feet from the bottom and the side that she lands on is 36 feet above the bottom of the canyon. The canyon is 50 feet across. She needs

our help to find the minimum speed to make it to the other side.

- a) What is the minimum speed that she needs to make it to the other edge of the canyon?
- b) How long is she in the air before she lands on the other side?

### Question 6

Craig has a large block of wood with a scale attached to it. When the block hangs from the scale, the scale reads 100 units. When he pulls the block along the level ground with the scale at a constant velocity, the scale reads 60 units. What will the scale read when he pulls the block up a  $30^\circ$  incline at a constant velocity? Assume the coefficient of friction is the same for sliding on the ground and up the incline. See the figure on the last page.

### Question 7

Consider the set of masses and pulley shown in the figure on the last page. A large mass  $M$  hangs over the pulley and pulls the other two blocks. One block has a mass of  $4m$ , with a smaller block of mass  $m$  on top. The coefficient of friction, both static and kinetic, between the surfaces is 0.6. Assume that the string and pulley are massless, and that the pulley spins without friction.

How much mass can the block  $M$  have such that the block  $m$  accelerates to the right without slipping on the lower block of mass  $4m$ .

### Question 8

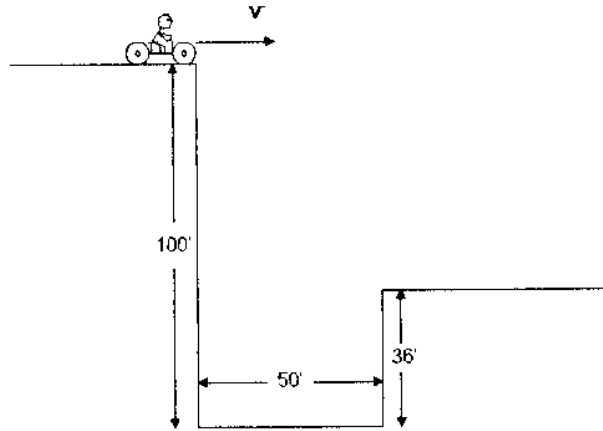
Carly always rows her boat with her maximum speed. The shortest time for her to get across the river is  $T$  seconds. If she rows the boat directly across the river from point  $A$  to point  $B$ , it takes her  $3T$  seconds. The river is  $d$  meters wide. See the figure on the next page.

Determine:

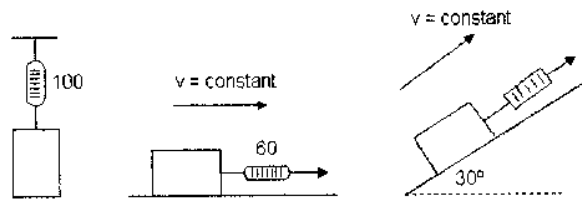
- a) Her maximum rowing speed. Express your answer in terms of  $d$  and  $T$ .
- b) The velocity of the river. Express your answer in terms of  $d$  and  $T$ .

*See the next page for the figures*

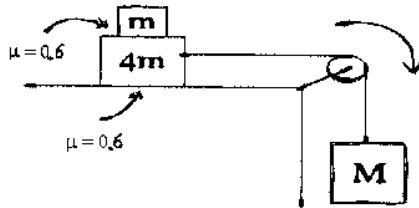
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6



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