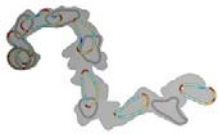
Physics 131- Fundamentals of Physics for Biologists I



Professor: Wolfgang Losert wlosert@umd.edu

11/19/2012

Reading for the Lab
LOG-LOG plots

http://www.youtube.com/watch?v=qybUFnY7Y8w

Schedule of Final exam

Reading on Logarithms for Lab

Foothold ideas: Kinetic Energy and Work

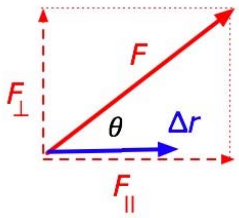
- Newton's laws tell us how velocity changes. The Work-Energy theorem tells us how speed (independent of direction) changes.
- Kinetic energy = $\frac{1}{2}mv^2$
- Work done by a force = $F_x \Delta x$ or $F_{||} \Delta r$ (part of force || to displacement)
- Work-energy theorem: $\Delta(\frac{1}{2}mv^2) = F_{||}^{net} \Delta r$

Dot products in general

$$F_{||}\,\Delta r \equiv \vec{F} \cdot \Delta\vec{r} \qquad \vec{F} \cdot \Delta\vec{r} = F\cos\theta\,\Delta r$$

In general, for any two vectors that have an angle θ between them, the dot product is defined to be $\vec{a} \cdot \vec{b} = ab\cos\theta$

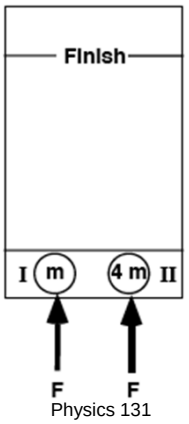
$$\vec{a} \cdot \vec{b} = a_x b_x + a_y b_y$$



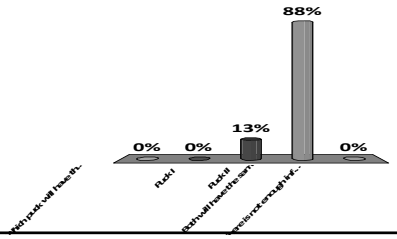
The dot product is a scalar. Its value does not depend on the coordinate system we select.

The diagram depicts two pucks on a frictionless table. Puck II is four times as massive as puck I. Starting from rest, the pucks are pushed across the table by two equal forces.

1. Which puck will have the greater KE upon reaching the finish line?
2. Puck I
3. Puck II
4. Both will have the same.
5. There is not enough information to decide.

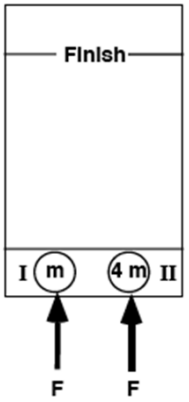


5

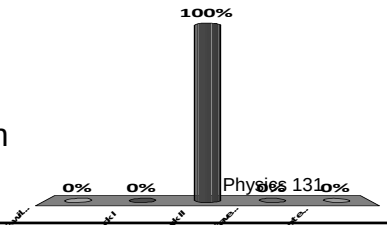


The diagram depicts two pucks on a frictionless table. Puck II is four times as massive as puck I. Starting from rest, the pucks are pushed across the table by two equal forces.

1. Which puck will have the greater momentum upon reaching the finish line?
2. Puck I
3. Puck II
4. Both will have the same.
5. There is not enough information to decide.

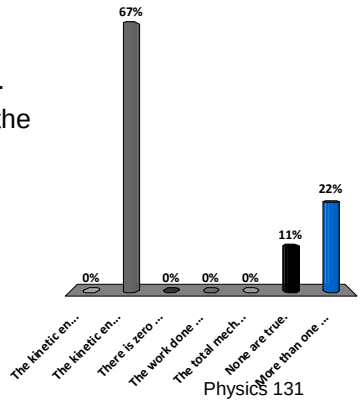


6



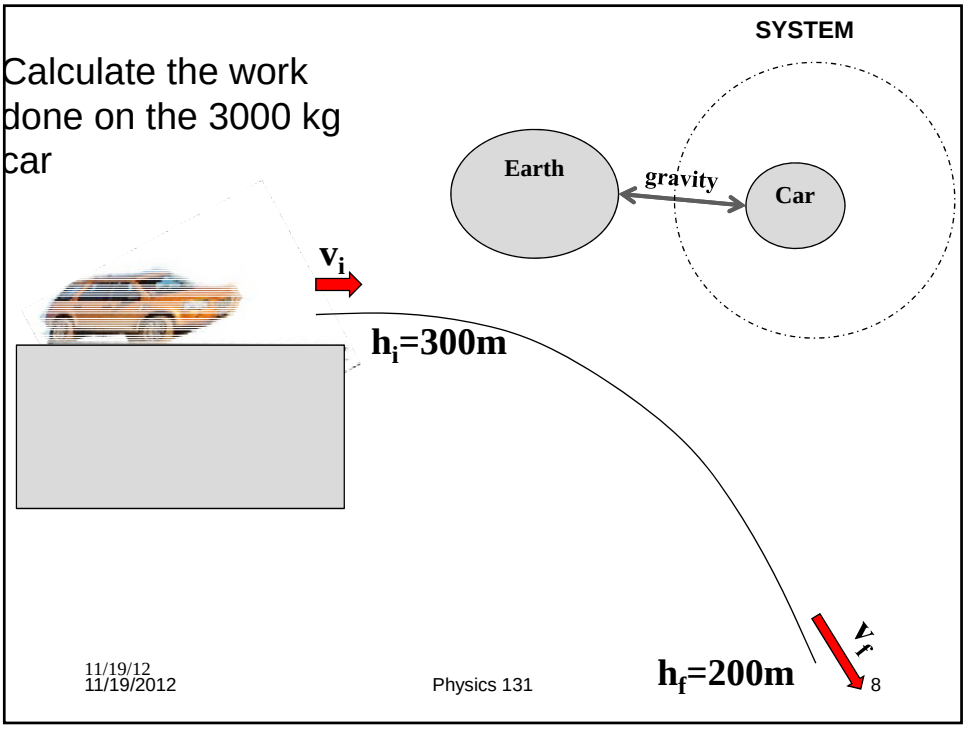
You drop a ball from a high tower and it falls freely under the influence of gravitational force. If you can ignore resistive forces, which of the following statements are true?

1. The kinetic energy of the ball increases by equal amounts in equal times.
2. The kinetic energy of the ball increases by equal amounts over equal distances.
3. There is zero work done on the ball by the gravitational force as it falls.
4. The work done on the ball by the gravitational force is negative as it falls.
5. The total mechanical energy of the ball decreases as it falls.
6. None are true.
7. More than one statement is true.



7 Physics 131

Calculate the work done on the 3000 kg car



11/19/12
11/19/2012 Physics 131 8