Introduction

"Here arises a puzzle that has disturbed scientists of all periods. How is it possible that mathematics, a product of human thought that is independent of experience, fits so excellently the objects of physical reality? Can human reason without experience discover by pure thinking properties of real things?"

-- Einstein

Now Available on *MasteringPhysics*

- Problem Set – Chapters 10 – 11
  - Due Friday, October 20 by 11:59 PM
  - I forgot to announce this in class on Monday
- Pre-Class Quiz – Chapter 13
  - Due Monday, October 23 by 10 AM
  - This is the last Pre-Class Quiz for the Mechanics section of PHY138
- Problem Set – Chapter 13
  - Due Friday, October 27 by 11:59 PM
  - This is the last Problem Set for the Mechanics section of PHY138

Reminder: Representative Assembly

- Each tutorial group should choose a Representative
- We will meet with the Representatives:
  - Friday, October 20
  - 3 – 4 PM
  - MP222 (North Wing, 2nd floor, East corridor)
- We will discuss issues of communication and organisation
  - We will not discuss Physics

More About Test Questions

- Some conceptual questions
- Some conventional problems
  - Combining things that you know into new forms
- What about derivations?
  - Combining things that you know into new forms
- Duplicating a problem or derivation from class or the textbook
  - Never

Remember when I said …

- Each concept in physics builds on previous ones
- That is now becoming very true in PHY138

Last Time

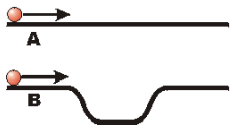
- Introduce Angular Momentum
- Kinetic Energy $K = \frac{1}{2} m v^2$
- Gravitational Potential Energy $U_g = mgy$
- Free fall:
  - $K + U_g = \text{constant}$
  - $\Delta K = -\Delta U_g$ Note the minus sign
- Gravitational Field
- The area under a force-distance plot = ΔK

Today

- Spring-Mass system §10.4 – 10.5
- Elastic Collisions §10.6
- Work & Kinetic Energy Chapter 11
  - Dot Product of Vectors
- Conservation of Energy
- Power

Racing Balls

Two balls are launched at the same time with equal speeds. Both balls reach the end of their tracks. Which ball reaches the end of its track first?

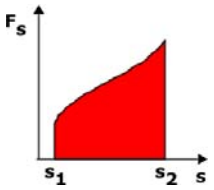


A. Ball A

B. Ball B

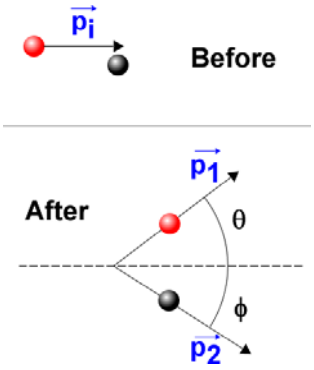
C. They reach the end of their tracks at the same time

Area Under F_s – s Curve

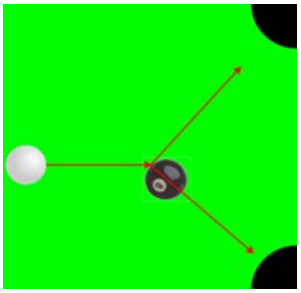


$$\int_{s_1}^{s_2} F_s \, ds = \frac{1}{2} m v_{sf}^2 - \frac{1}{2} m v_{si}^2$$

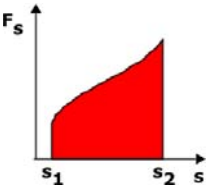
Billiards 101



A "Scratch Shot"



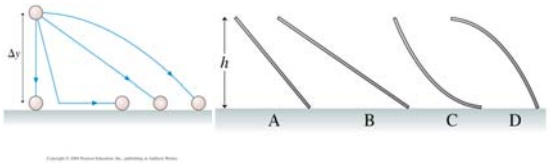
Area Under F_s – s Curve



$$\int_{s_1}^{s_2} F_s \, ds = \frac{1}{2} m v_{sf}^2 - \frac{1}{2} m v_{si}^2$$

Figure 11.20

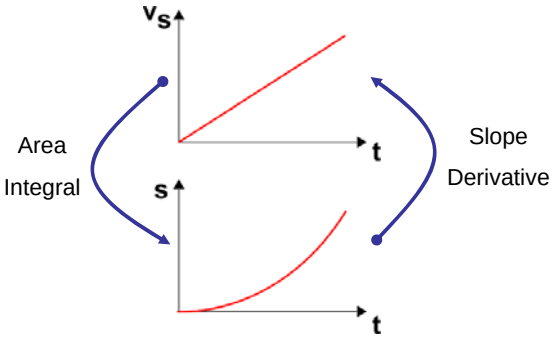
Stop To Think 10.2: Child on a Slide



W_{grav} the same

ΔU_g the same

Recall ….



Last Time

- Introduce Angular Momentum
- Kinetic Energy $K = \frac{1}{2} m v^2$
- Gravitational Potential Energy $U_g = mgy$
- Free fall:
  - $K + U_g$ = constant
  - $\Delta K = -\Delta U_g$ Note the minus sign
- Gravitational Field
- The area under a force-distance plot = ΔK

Jumping Organisms Have Long Legs