Today   Ch 4  Forces
Friday   Ch 4  Forces    HW9:
No Lab

• Transition / Introduction
  o Big Picture
    ▪ Fundamental Law of Mechanics:
      o Where we’ve been: Kinematics
      o Where we’re going: Dynamics.

• Forces and Newton’s Laws

4.1 Concept of Forces
• Physics Interactions, Forces –
  o Free-Body Diagrams
    ▪ Forces as Vectors
    • Direction
    • Magnitude
    ▪ Examples

4.2 Newton’s First Law of Motion
  o How do interactions, Forces, affect motion?
  o Conceptual Question 1: Is a net force being applied to an object when the
    object is moving downward (a) with a constant acceleration of 9.80 m/s² and
    (b) with a constant velocity of 9.8 m/s? Explain.

  o Inertia & Mass

4.3 Newton’s Second Law of Motion
• Single, unbalanced force
• Net Force
  o Units
    ▪ Base Units
  • Conceptual Question 2: Newton’s second law indicates that when a net force
    acts on an object, it must accelerate. Does this mean that when two or more
    forces are applied to an object simultaneously, it must accelerate? Explain.

  o Examples, 1-D
  o Example 0. Playing hockey, I give a 0.3 kg puck a 100 N whack. During the whack,
    what’s the magnitude of the puck’s acceleration?

  o Example 1. Say you’re playing soccer and you and an opponent get to the 0.05 kg
    ball and try to kick it at the same time – you kick it forward with 500 N and they kick
    it backwark with 400 N. What’s the resulting acceleration?

  o Example 2. You and a friend are pushing a stalled car of mass 1850 kg. You apply a
    force of 275 N forward, your friend applies one of 395 N forward, but there’s a net
    resistance (friction) of 560 N backwards. What’s the acceleration of the car?

Ex. 3 In the above problem, if you’ve got the car moving at 0.40 m/s at one moment,
how long until you’ve got it moving at 0.50 m/s?
HW9 Statement       Ch 4 Pr. 2, 6, 8       Phys 220
Problems from Cutnell & Johnson 6th Ed., solutions from accompanying source.

2. Concept Simulation 4.1 at www.wiley.com/college/cutnell (6th Ed. Student Companion Site) reviews the central idea in this problem. A boat has a mass of 6800 kg. Its engines generate a drive force of 4100 N, due west, while the wind exerts a force of 800 N, due east, and the water exerts a resistive force of 1200 N due east. What is the magnitude and direction of the boat’s acceleration?

6. Interactive Learning Ware 4.1 (http://www3.interscience.wiley.com:8100/legacy/college/cutnell/0471151831/ilw/audio/ilw.html) reviews the approach taken in problems such as this one. A 1580-kg car is traveling with a speed of 15.0 m/s. What is the magnitude of the horizontal net force that is required to bring the car to a halt in a distance of 50.0 m?

8. An arrow, starting from rest, leaves the bow with a speed of 15.0 m/s. If the average force exerted on the arrow by the bow were doubled, all else remaining the same, with what speed would the arrow leave the bow?