

**Assignment VI, FYSE 130**  
**Fall 2014**  
**Due 9/26/14 at start of class**

Remember, work out and submit your answers on a separate piece of paper, and organize the solutions carefully! Feel free to work with your classmates on these problems, just make sure you make a note of this in your solutions.

1. At the beginning of a tennis point, a ball is tossed into the air to serve it. As it is hit, the ball is essentially motionless. After coming off of the racket, it is moving rather rapidly. For this problem, we will assume that the ball is moving at about 100 miles per hour.
  - a) How fast is the ball moving in meters per second?
  - b) If the impact with the tennis racket lasts one tenth of a second, what was the average force applied by the racket to the ball? (You will have to google the mass of a tennis ball. Remember to use metric!)
  - c) If the impact with the tennis racket lasts one hundredth of a second, what was the average force applied by the racket to the ball?
  - d) If the impact with the tennis racket lasts one thousandth of a second, what was the average force applied by the racket to the ball?
2. Watch the following movie: <https://www.youtube.com/watch?v=sfEeAWdddSU>. This movie shows a football being kicked at 1200 frames per second. (So one second of movie time equals 1/1200 second of real time). Assume this kick went at least 50 yards in the air. What is the minimum amount of force applied to the ball?
3. Watch at least the first two minutes of the following movie: <https://www.youtube.com/watch?v=QFIElybC7rU>. This movie shows a baseball being deformed by colliding with a bat. The baseball is moving faster than a normal pitch, but the bat is stationary. These two effects sort of cancel out, so the collision has more or less the same impact time as a normal swing hitting a ball. Use this movie to estimate the total force applied by a bat on a baseball. (You may have to google a couple of parameters of a baseball).