

# Physics 21 Problem Set 4

Harry Nelson

Due Monday, Jan. 31 in class  
**MIDTERM FRIDAY Jan. 28**

Please make your work neat, clear, and easy to follow. It is hard to grade sloppy work accurately. Generally, make a clear diagram, and label quantities. Derive symbolic answers, and then plug in numbers after a symbolic answer is available.

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1. K&K 2.25.
  2. K&K 1.21.
  3. A baseball batter hits a pitched ball at a height of 4.0 ft above the ground so that its angle above the horizontal is  $45^\circ$  and its initial speed is 110 ft/s. The ball is hit toward a 24 ft high fence that is located 320 feet from the batter. Will the ball clear the fence?
  4. Galileo, in his *Two New Sciences*, states that “for elevations (meaning, angles above the horizontal) which exceed or fall short of  $45^\circ$  by equal amounts, the ranges are equal...” Prove this statement.
  5. A juggler uses one hand to keep five balls in motion, throwing each sequentially up to a height of 3.0 m. Neglect the time to catch and throw balls.
    - (a) Determine the time interval between successive throws, assuming that the juggler throws them up at equal time intervals.
    - (b) Give the positions of the other balls at the instant when the first ball falls back into the juggler’s hand.
  6. K&K 2.17.
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