

# Homework No. 04A (Spring 2022)

## PHYS 205A-001: University Physics

Due date: Monday, 2022 Feb 7, Noon, on D2L

### Instructions

- To the extent to which you depend on resources to complete this homework is a measure of how much extra work you need to put in to master the related concepts. Solutions are available at <http://sphics.com/tc/202101-SIU-P205A/>.
- Describe your thought process in detail and organize it clearly. Make sure your answer has the correct units and the right number of significant digits.
- After completion, scan the pages as a single PDF file, and submit the file on D2L (under Assessments → Assignments).

### Problems

1. **(10 points.)** The launch speed of a projectile is three times its speed at maximum height. Find the launch angle.
2. **(10 points.)** (Based on Problem 15 in Chapter 4 of textbook.) The range of a projectile is three times its maximum height. Find the launch angle.
3. **(10 points.)** A student slides a mass off the top of a horizontal table. The height of the table is 1.30 m. The mass slides off the table with a horizontal velocity of 3.50 m/s. How far from the base of the table does the mass strike the floor?
4. **(10 points.)** (Based on Example 4.4 in textbook.) A stone is thrown upward from the top of a building at an angle of  $30.0^\circ$  to the horizontal with an initial speed of 10.0 m/s. The height from which the stone is thrown is 45.0 m above the ground. How long does it take to reach the ground? How will the answer change if the stone is thrown downward at an angle of  $30.0^\circ$  to the horizontal with an initial speed of 10.0 m/s.
5. **(10 points.)** A placekicker must kick a football from a point 36.0 m (about 40 yards) from the goal. Half the crowd hopes the ball will clear the crossbar, which is 3.05 m high. When kicked, the ball leaves the ground with a speed of 20.0 m/s at an angle of  $40.0^\circ$  to the horizontal. By how much does the ball clear or fall short of clearing the crossbar? (Enter a negative answer if it falls short.)
6. **(10 points.)** A rifle is aimed at a bullseye. The muzzle speed of the bullet is 750 m/s. The gun is pointed directly at the center of the bullseye, but the bullet strikes the target 0.25 m below the center. What is the horizontal distance between the end of the rifle and the bullseye?