

## Homework No. 05 (Spring 2025)

### PHYS 205A-001: UNIVERSITY PHYSICS

*School of Physics and Applied Physics, Southern Illinois University–Carbondale*

Due date: Wednesday, 2025 Feb 12, Noon, on D2L

### Instructions

- You are encouraged to use any of the resources to complete this homework. However, the extent to which you depend on resources while doing this homework is a measure of how much extra work you need to put in to master the associated concepts. Solutions should be the last resource.
- Links to solutions are provided.
- Variations of homework problems and additional problems with hyperlinks to old exams are available in [Lecture Notes](#). These serve as practice problems.
- Describe your thought process in detail and organize it clearly. Make sure your answer has units and right number of significant digits.
- After completion, scan the pages as a single PDF file, and submit the file on D2L (under Assesments → Assignments). You can replace your PDF file as many times as you like, only the last file is graded. The deadline has an (undisclosed) buffer period, so do not hesitate to try submissions after the deadline.

### Problems

1. (**10 points.**) A boat is able to move through still water at 20.0 m/s. It makes a round trip to a town 3.0 km downstream. Assume all motion to be along a straight line. That is, the boat first travels in the direction of river and while returning travels against the direction of river. If the river flows at 5.0 m/s, determine the time required for this round trip.

[[Solution](#)]

2. (**10 points.**) A car travels due east with a speed of 40.0 km/h. Raindrops are falling at a constant speed vertically with respect to the ground. The traces of the rain on the side windows of the car make an angle of  $76.0^\circ$  with the vertical.
  - (a) Find the speed of the rain with respect to the ground.
  - (b) Find the speed of the rain with respect to the car.

[Solution]

3. (10 points.) The wind is flowing at a speed of 20 m/s in the direction  $30^\circ$  North of West with respect to the ground. Determine the direction and speed of the aeroplane should head (with respect to the wind) such that the aeroplane heads North (with respect to the ground) with speed 80.0 m/s.

[Solution]