

Midterm Exam No. 01 (Spring 2025)

PHYS 205A-001: UNIVERSITY PHYSICS

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

Date: 2025 Feb 10

(Name)

(Signature)

Instructions

1. Seating direction: On even-numbered seats in alternate rows, B, D, F,
2. Total time = 50 minutes.
3. There are 4 conceptual questions and 3 problems in this exam.
4. Equation sheet is provided separately.
5. For partial credit you need to present your work in detail and organize it clearly.
6. A simple calculator (with trigonometric functions) is allowed.
7. Use of smart devices, including smart watches, is strictly prohibited. They should stay out of reach during the exam.
8. Academic misconduct will lead to a failing grade in the course.

1. (5 points.) Given the equation

$$A = B + Ct, \tag{1}$$

where B has the dimensions of length L and t has the dimension of time T . What is the dimension of C ?

2. (5 points.) The position of an object moving in a straight line as a function of time is plotted in Figure 1. Is the object speeding or slowing at 2.0 hours?

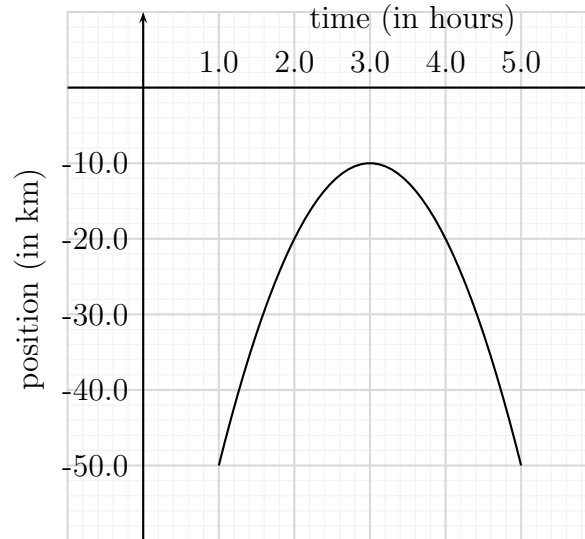


Figure 1: Problem 2.

3. (5 points.) Given

$$\vec{C} = \vec{B} - \vec{A}. \quad (2)$$

For vectors \vec{A} and \vec{B} shown in the diagram in Figure 2 draw the vector \vec{C} on the diagram.

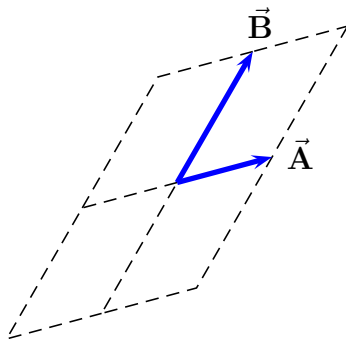


Figure 2: Problem 3.

4. (5 points.) A projectile is launched with an initial velocity of magnitude $v_0 = 32 \text{ m/s}$ at an angle $\theta_0 = 40^\circ$ above the horizontal. What is the magnitude and direction of the velocity of the projectile when it is at the highest point B in Figure 3?

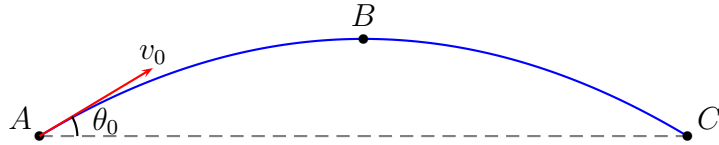


Figure 3: Problem 4.

5. (**10 points.**) While standing on a 50.0 m tall building you throw a stone straight upwards at a speed of 15 m/s. How high, above the building, does the stone reach?

6. (10 points.) Two vectors $\vec{\mathbf{A}}$ and $\vec{\mathbf{B}}$ have equal magnitudes of 5.00 m. Vector $\vec{\mathbf{A}}$ is pointing along the negative x axis, and vector $\vec{\mathbf{B}}$ makes an angle of 60° counterclockwise with positive x axis. Determine the magnitude and direction of the vector $\vec{\mathbf{A}} + \vec{\mathbf{B}}$.

7. (10 points.) A rifle is aimed at a bullseye. The muzzle speed of the bullet is 600. 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?



Figure 4: Problem 7