Midterm Exam No. 01 (2023 Spring)

PHYS 205A-001: UNIVERSITY PHYSICS

Department of Physics, Southern Illinois University–Carbondale
Date: 2023 Feb 13

(Name)	(Signature)

Instructions

1. Seating direction: Please be seated on seats with seat-numbers divisible by 4.

2. Total time = 50 minutes.

3. There are 4 conceptual questions and 3 problems in this exam.

4. Equation sheet is provided separately.

5. To be considered 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. Restroom breaks are allowed. Under questionable circumstances this might lead up to a Makeup Exam.

9. Academic misconduct will lead to a failing grade in the course.

1. (**5 points.**) Given the equation
$$A = B + mc^2, \tag{1}$$
where A has the dimensions ML^2T^{-2} and m has the dimension M. What is the dimension of B?

2. (**5 points.**) When you throw a ball up in the air what is the velocity of the ball when it reaches the highest point? What is the instantaneous acceleration of the ball when the ball reaches the highest point?

3. (**5 points.**) Find the components of vector **A** whose magnitude is 10.0 m and its direction is 30.0° counterclockwise with respect to the positive y axis.

4. (**5 points.**) A projectile is launched with an initial velocity of magnitude $25\,\mathrm{m/s}$ and launched at an angle $30°$ above the horizontal. What is the magnitude and direction of velocity when the projectile is at the highest point?

5. (**10 points.**) While standing on the edge of a 50.0 m tall building you throw a stone straight downwards at a speed of 15 m/s. How long does the stone take to reach the ground?

6. (**10 points.**) A golfer takes two strokes to putt a golf ball into a hole. On the first stroke, the ball moves 5.0 m at an angle 60.° West of South. On the second, it moves 6.0 m at an angle 30.° North of West. If the golfer had instead hit the ball directly into the hole on the first stroke, what would have been the magnitude and direction of the ball's displacement?

7. (**10 points.**) A student slides a mass off the top of a horizontal table. The height of the table is $1.3\,\mathrm{m}$. The mass slides off the table with a horizontal velocity of $3.5\,\mathrm{m/s}$. How far from the base of the table does the mass strike the floor?