



Physics 101

Summer Semester

First Midterm Exam

Saturday, July 5, 2025

9:00 AM – 10:30 AM

Student's Name: Serial Number:

Student's Number:Section:

Choose your Instructor's Name:

Instructors: Drs. Al Dosari, Al Jassar, Al Qattan, Alsmadi, Salameh, Zaman

For Instructors use only

Grades:

#	SP1	SP2	SP3	SP4	SP5	LP1	LP2	Q1	Q2	Q3	Q4	Total
	2	2	2	2	2	3	3	1	1	1	1	20
Pts												

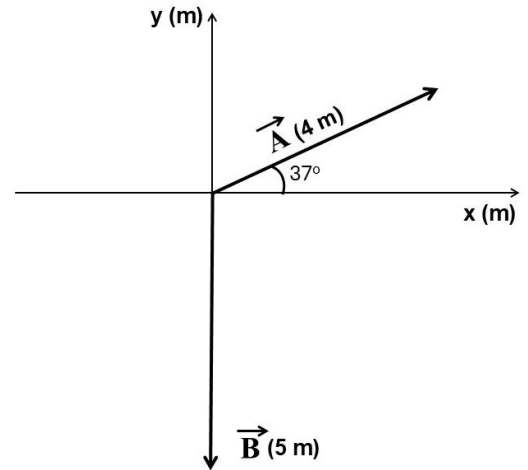
Important:

1. Answer all questions and problems (No solution = no points).
2. Full mark = 20 points as arranged in the above table.
3. **Give your final answer in the correct units.**
4. Assume $g = 10 \text{ m/s}^2$.
5. Mobiles are **strictly prohibited** during the exam.
6. Programmable calculators, which can store equations, are not allowed.
7. **Cheating incidents will be processed according to the university rules.**

GOOD LUCK

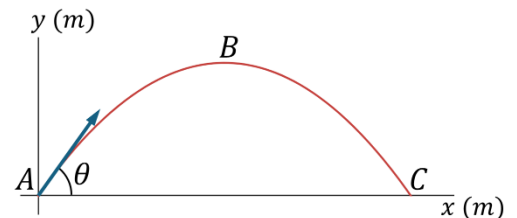
Part I: Short Problems (2 points each)

SP1. Two displacement vectors $|\vec{A}| = 4\text{ m}$ and $|\vec{B}| = 5\text{ m}$, are shown in the figure. **Find $\vec{A} + \vec{B}$ in unit vector notation.**



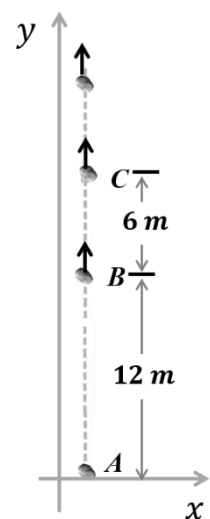
SP2. Given two vectors $\vec{A} = 2\hat{i} - 2\hat{j}$ and $\vec{B} = \hat{i} + 3\hat{j} + 2\hat{k}$. **Find $\vec{A} \times \vec{B}$**

SP3. A stone is projected from the ground at point A with a speed of 20 m/s at an angle $\theta = 37^\circ$, as shown. **Find the velocity of the stone at point C (just before it hits the ground) in unit vector notation.**



SP4. A particle moves along a **circular path** with a radius $R = 2\text{ m}$. At an instant when its **speed** is 3 m/s and increasing at a rate of 5 m/s^2 , **what is the magnitude of its total acceleration?**

SP5. A stone is thrown **vertically upward** from the ground at point A with an **initial velocity** (\vec{v}_0). It takes 0.8 seconds to travel from point A to point B. **How long will it take to travel from point A to point C?**



Part II: Long Problems (3 points each)

LP1. A particle moves along the x-axis. Its position as a function of time is given by $x(t) = -12t + 1.5t^2$, where x is in *meters* and t is in *seconds*.

a) Find the speed of the particle at $t = 0$ s.

b) Find the average acceleration of the particle during the period from $t = 1$ s to $t = 3$ s.

c) At what time will the particle change its direction of motion?

LP2. A particle moving with **constant acceleration** in the **xy -plane** starts from the **origin** with an initial velocity $\vec{v}_0 = (4\hat{i} + 10\hat{j}) \text{ m/s}$ and **comes to rest momentarily** at $t = 2.5\text{s}$.

a) **Find its acceleration in unit vector notation.**

b) **Find its position at $t = 2.5\text{s}$ in unit vector notation.**

c) **After $t = 2.5\text{s}$, the x-component of the particle's velocity would be:**

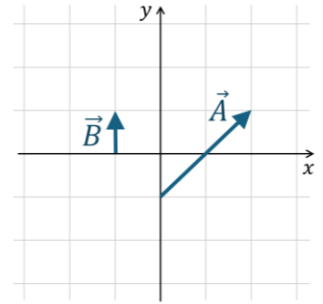
* Positive

* Negative

* Zero

Part III: Questions (Choose the correct answer, one point each)

Q1. Vectors \vec{A} and \vec{B} are shown in the figure. If $\vec{C} = \vec{A} - \vec{B}$, then **which of the following statements is correct about the y-components of these vectors?**



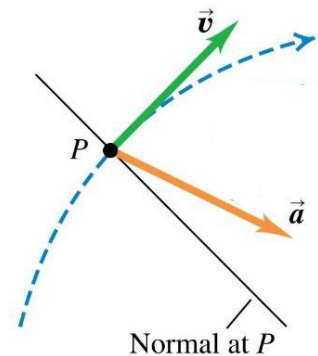
- * $|C_y| > |A_y|$
- * $|C_y| > |B_y|$
- * $|C_y| < |B_y|$
- * $|C_y| = |B_y|$

Q2. A particle moves along the positive x-direction with **constant acceleration** (\vec{a}), the magnitude of its **velocity** ($|\vec{v}|$) is **increasing** with time. **Which one of the following statements must be correct?**

- * $\vec{v} \cdot \vec{a} = 0$
- * $\vec{v} \times \vec{a} = |\vec{v}||\vec{a}|$
- * $\vec{v} \cdot \vec{a} = |\vec{v}||\vec{a}|$
- * $\vec{v} \cdot \vec{a} = -|\vec{v}||\vec{a}|$

Q3. A particle is moving along a **curved path** and the direction of its **total acceleration** \vec{a} at point P is shown in the figure. **At point P, the particle is:**

- * moving with constant speed
- * speeding up
- * slowing down
- * having only centripetal acceleration



Q4. A ball is shot such that it leaves the player's foot at point A above ground level, as shown. During the ball's travel **from point A to point B**, which of the following graphs represents the y-component of the **ball's velocity** (v_y) as a function of time?

