

Physics 101

Spring Semester

First Midterm Exam

Saturday, October 25, 2025

8:00 – 9:30 AM

Student's Name: Serial Number:

Student's Number:Section:

Choose your Instructor's Name:

Instructors: Drs. Al Dosari, Al Jassar, Al Qattan, Al Smadi, Askar, Demir, 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:

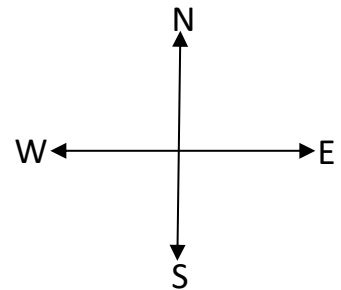
1. Answer all questions and problems (No solution = no points).
2. Full mark = 20 points as arranged in the above table.
3. **Give your final answer in the correct units.**
4. Assume $g = 10 \text{ m/s}^2$.
5. Mobiles are **strictly prohibited** during the exam.
6. Programmable calculators, which can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

GOOD LUCK

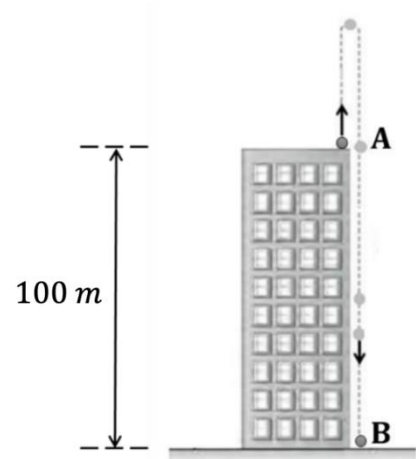
Part I: Short Problems (2 points each)

SP1. Find the angle between the vector $\vec{A} = 6\hat{i} - 3\hat{j} + 2\hat{k}$ and the **+ x axis**.

SP2. A Kuwait University professor starts walking 5 m East, then 15 m at 37 degrees North of West. Find the **magnitude and direction of the resultant displacement**.



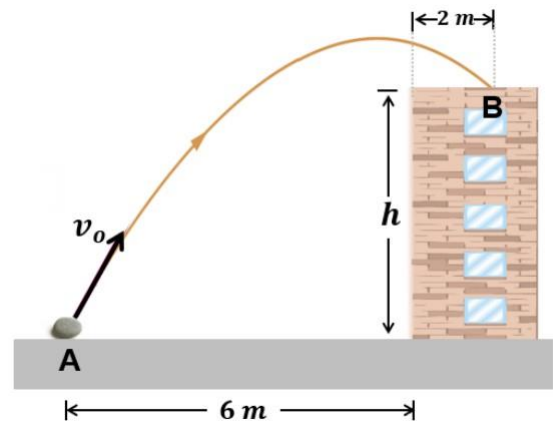
SP3. A ball is thrown **vertically upward** from point A at the top of a building 100 m high, as shown. It reaches its **maximum height** after 2 seconds. Find its velocity (in m/s) at point B, just before it touches the ground.



SP4. An object moves in the *xy plane* with its position vector as a function of time given by:

$\vec{r}(t) = (t^2)\hat{i} + (8t - t^2)\hat{j}$, where $\vec{r}$ is measured in *meters* and t is measured in *seconds*. **Find the time** when the velocity $\vec{v}(t)$ **is perpendicular to** the acceleration $\vec{a}(t)$.

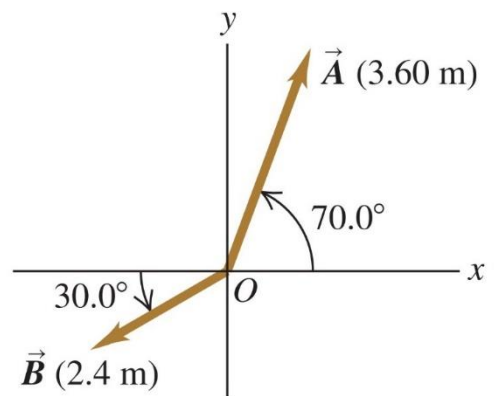
SP5. A stone is thrown from point A with an initial speed v_0 . The stone strikes the roof of a building at point B. If the **time to travel from point A to point B is 2 seconds**, and the height $h = 16\text{ m}$, **find the initial velocity $\vec{v}_0$ in unit vector notation**.



Part II: Long Problems (3 points each)

LP1. Given two vectors $\vec{A}$ and $\vec{B}$ with their magnitudes and directions shown in the figure.

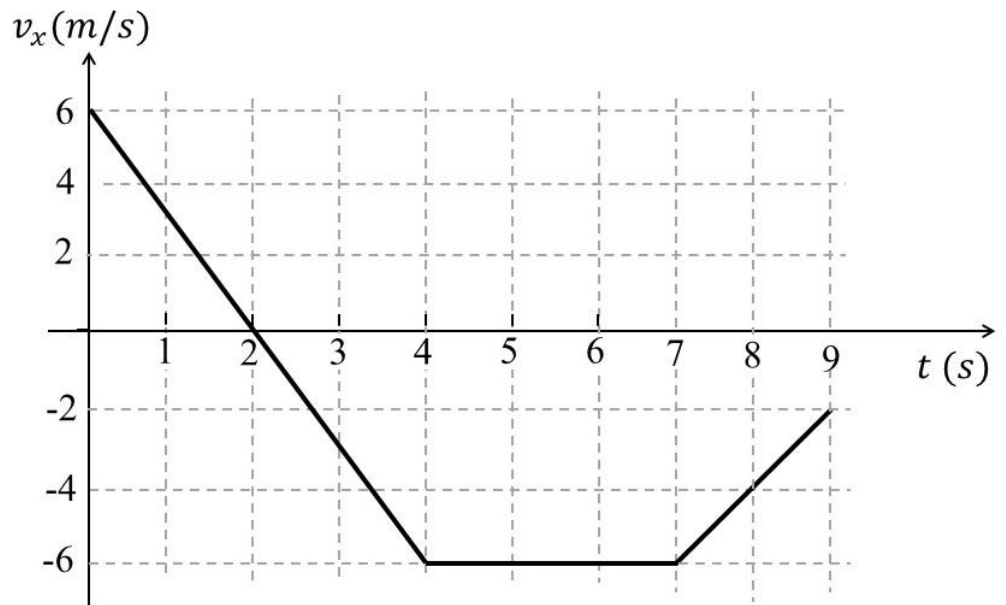
(a) Find the vector $\vec{C} = 2\vec{A} - \vec{B}$, in unit vector notation.



(b) Find the scalar product $\vec{A} \cdot \vec{B}$

(c) Find the vector product $\vec{A} \times \vec{B}$. Indicate the magnitude and direction.

LP2. The velocity time graph of an object moving along the x-axis is shown in the figure.



(a) Find the object's acceleration at $t = 2$ seconds.

(b) Find when the object stops momentarily.

(c) Find the total distance traveled between $t = 0$ and $t = 7s$.

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

Q1. A particle moves along the x -axis and has a position given by $x(t) = t^2 + 10$ where x is in *meters* and t is in *seconds*. Which of the following statements is true when $t > 0$?

- * The particle is at the origin at some time.
 - * The velocity of the particle doubles every second.
 - * The acceleration of the particle is constant.
 - * The particle changes its direction some time.
-

Q2. Given two vectors $\vec{A}$ and $\vec{B}$ such that $|\vec{A}| = 3$ and $|\vec{B}| = 4$. Which of the following represents the allowed range for the magnitude of their cross product $|\vec{A} \times \vec{B}|$?

- * $|\vec{A} \times \vec{B}| > 12$
 - * $|\vec{A} \times \vec{B}| < -12$
 - * $0 \leq |\vec{A} \times \vec{B}| \leq 12$
 - * $-12 \leq |\vec{A} \times \vec{B}| \leq 0$
-

Q3. The value of $\hat{j} \cdot (\hat{k} \times \hat{i})$ is

- * -1
 - * $+1$
 - * 0
 - * $\hat{i}$
-

Q4. A particle moves in circular motion at constant speed. Which of the following is a possible set of velocity and acceleration vectors for the particle?

- * $\vec{v} = 2\hat{i}, \quad \vec{a} = 0$
- * $\vec{v} = 2\hat{i}, \quad \vec{a} = -6\hat{i}$
- * $\vec{v} = 2\hat{i}, \quad \vec{a} = -6\hat{i} + 6\hat{j}$
- * $\vec{v} = 2\hat{i}, \quad \vec{a} = 6\hat{j}$