In His Name

El-Mahdi Schools **Mathematics Department**

Grade 10 (S) **Midyear common exam (07 – 08)** **Duration: 150 minutes**

The plane, when needed, is referred to an orthonormal system $(O; \vec{i}; \vec{j})$

I- (4 points)

In the table below, only one of the proposed answers to each question is correct. **Write** down the number of each question and give, **with justification**, the answer corresponding to it.

№	Questions	Answers		
		A	**B**	**C**
1^o	If $\overrightarrow{AB} = \overrightarrow{CA}$, then	ABC is an isosceles triangle	A,B, and C are collinear	(AB) and (BC) are parallel
2^o	The direction vector $\vec{R}$ of (d): 3x – y + 5 = 0 is	$\vec{R}(3, -1)$	$\vec{R}(1,-3)$	$\vec{R}(1,3)$
3^o	Given: (D) : $\begin{cases} x = 2t - 1 \\ y = 3 - 5t \end{cases}$ The director coefficient of (D) is:	$\frac{2}{3}$	$\frac{-5}{2}$	$\frac{-1}{3}$
4^o	$\cos^2 180° + \sin^2 179°$ is	Less than 1	Greater than 1	1

II- (3.5 points)

Given: E = $\{x \in IN^* \, / \, x < 10\}$, A = {1,2,3,4}, B = {2,3,5,7} and $\overline{C}$ = {2,5,6,9}, where C is a subset of E.

1) **Write** B in comprehension and C in extension.
2) **Determine**, in extension, $A \cap C$ and $\overline{B \cup C}$.
3) **How many** 3-different-digit numbers can we form using the elements of E?

III- (3 points)

Given the two straight-lines (D) and (D'):

(D) : 2x – y – 4 = 0 and (D') : $\begin{cases} x = 1 - t \\ y = 3t + 1 \end{cases}$

1) **Prove** that (D) and (D') are concurrent**; find** the coordinates of their point of intersection.
2) **Find** a cartesian equation of the straight-line that passes through A (1; -2) and parallel to (D').

IV- (4.5 points)

1) **Simplify**: $A = \cos(3\pi + x) + \cos\left(\frac{5\pi}{2} - x\right) + \sin\left(\frac{3\pi}{2} - x\right) + \sin(-4\pi - x)$.
2) **Show** that: $\frac{\sin^2 x + \sin x \cos x}{\sin^2 x - \cos^2 x} = \frac{\tan x}{\tan x - 1}$
3) **Prove** that: $\sin^2 22° + \cos^2 20° + \sin^2 68° + \cos^2 70° = 2$

V- (5 points)

1) **Solve** in IR: $\begin{cases} \frac{x+1}{3} - \frac{x-1}{4} > \frac{x}{2} - \frac{2}{3} \\ \frac{(x-2)^2 - (2x-1)^2}{x-2} \leq 0 \end{cases}$
2) **Solve,** graphically: $\begin{cases} x - y - 1 < 0 \\ 2x + y + 2 \leq 0 \end{cases}$

VI- (5 points)

Consider the points A (-3; 2), B (-1; 1), and C (5; 2).

1) **Express** $\overrightarrow{AB}$ in terms of $\vec{i}$ and $\vec{j}$.
2) Let D be the point in the plane such that ABCD is a parallelogram of center I. **Calculate** the coordinates of D and I.
3) Let $\overrightarrow{U}$ (9; -0.5) and $\overrightarrow{V} = \overrightarrow{AB} + 2\overrightarrow{AC}$ be two vectors in the plane.
   a) **Calculate** the coordinates of $\overrightarrow{V}$.
   b) **Show** that $\overrightarrow{U}$ and $\overrightarrow{V}$ have the same direction.

VII- (5 points)

Let A, B, C, and D be four given points in the plane and let E be the point defined by: $\overrightarrow{EA} + \overrightarrow{EB} + \overrightarrow{EC} + \overrightarrow{ED} = \vec{0}$

1) **Prove** that, for every point O in the plane, $\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC} + \overrightarrow{OD} = 4\overrightarrow{OE}$
2) Let G be the point defined by: $3\overrightarrow{OG} = \overrightarrow{OB} + \overrightarrow{OC} + \overrightarrow{OD}$. **Prove** that G is the center of gravity of triangle BCD.
3) **Show that** A, E, and G are collinear and precise the position of E.

Good Work