In his name

The Islamic Institution For Education & Teaching
Al-Mahdi Schools

Mid Year Exam

Math Department

February 2014

Subject: Mathematics

Class: Grade 10 | Duration: 150 minutes

Question I : (4pts)

In the table below, only one of the proposed answers to each question is correct. Write down the letter corresponding to the proper answer, **with justification**.

nº	Questions	Answers		
		a	b	c
1	If $\left\|x^2-5\right\|=-3$ then	No solution for x	$x\in\{2\sqrt{2},-2\sqrt{2}\}$	$x\in\{-\sqrt{2},\sqrt{2},2\sqrt{2},-2\sqrt{2}\}$
2	If [-5 , 1] $\cap$ X= [-3 , 1] ,then X=	[-3 ,3 [	] -3 ,+ ∞ [	] -5, -3]
3	Given: $\sin x=\frac{\sqrt{3}}{3}$. Then $\cos(x+\frac{5\pi}{2})=$	$\frac{1}{\sqrt{3}}$	$-\frac{1}{\sqrt{3}}$	$\sqrt{\frac{2}{3}}$
4	*If* $x<0$, then $\frac{\sqrt[4]{x^4}}{\sqrt[3]{x^3}}=$	does not exist	-1	1

Question II : (2.5 pts)

Consider the sets: A = $\{x\in Z \,/\, (x-1)(x^2-16)(2x+1)=0\}$ & B = $\{\, x\in IN \,/\, \left|x-\frac{3}{2}\right|\langle\frac{5}{2}\}$

1) Show that : A = {-4 , 1 , 4} and B = {0 , 1 , 2 , 3} .
2) Write in extension : A$\cap B$ and A$\cup$ B.
3) Complete by $\in,\notin,\subset,\not\subset$:
   i. -4 …… A
   ii. $\{1;4\}$…… A.

Question III : (3pts)

Solve the following system: $\begin{cases}(x+1)(x^2+1)>0\\ \frac{4x^2-25-3(2x-5)}{x+4}\le 0\end{cases}$

Question IV : (4.5 pts) (the 2 parts are independent)

1) Given : $3\le x\le 4$ and $-2\le y\le -1$, and $E=\frac{2x-1}{x^2+y^2}$ .Show that $\frac{1}{4}\le E\le\frac{7}{10}$

2) Simplify: a) $\frac{9^{\frac{2}{5}}\times 6^{\frac{3}{5}}}{\sqrt[5]{9}\times\sqrt[5]{2^3}\times\sqrt[5]{3^3}}$

b) $\sqrt{(\sqrt{7}-3)^2}+\sqrt[3]{(2\sqrt{7}-5)^3}-\left|2-\sqrt{7}\right|$

Question V : (6.5 pts) (the four parts are independent)

1) Simplify: $\sin(7\pi - x) - \cos(-9\pi - x) - \cos\left(\frac{9\pi}{2} - x\right) + \tan(\frac{14\pi}{2} + x)$
2) Show that : $tan^2x - sin^2x = (tan^2x)(sin^2x)$
3) Simplify $: \cos^2 31^o + \cos^2 59^o - \cos 120^o$
4) *Given* $: (\sin x + \cos x)^2 = \frac{5}{4}$, where $x \in [\pi, \frac{3\pi}{2}]$

i. Show that : $\sin x . \cos x = \frac{1}{8}$

ii. Calculate $\frac{1}{\sin x} + \frac{1}{\cos x}$

Question VI : (5.5 pts)

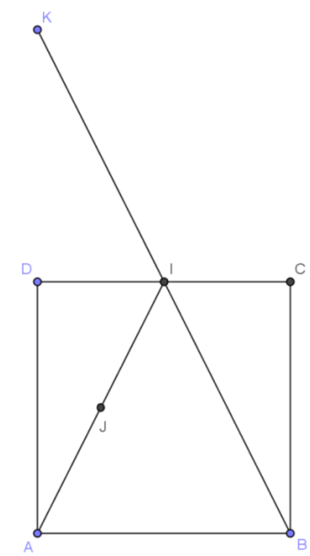
In a system ($O ; \vec{i} ; \vec{j}$) , consider the points: $A(2 ; 5)$; $B(-2;2)$; $C(0;-4)$.

1) Find the coordinates of the vector $\vec{V} = 2\overrightarrow{AB} - 3\overrightarrow{AC}.$
2) Prove that A , B and C determine a triangle.
3) Let M(2x+1 ; 2y+4) :
   a- Calculate x and y if M is the centroid of the triangle ABC .
   b- Find a relation between x and y if the vectors $\overrightarrow{AM}$ and $3\overrightarrow{AB}$ are collinear.
4) Find the coordinates of the point $B(-2;2)$ in the system ($C ; \vec{i} ; \vec{j}$)

Question VII : (4 pts)

ABCD is a square. The points I and J are respectively the midpoints of [DC] and [AI].

The point K is defined by: $\overrightarrow{IK} = -\overrightarrow{IB}$



1) Redraw the figure
2) Show that : $\overrightarrow{JK} = -\frac{1}{2}\overrightarrow{IA} - \overrightarrow{IB}$
3) Let L be a point defined by: $2\overrightarrow{LA} + \overrightarrow{LB} = \vec{0}$
   a) Verify that : $\overrightarrow{AL} = \frac{1}{3}\overrightarrow{AB}$. Construct L .
   b) Show that : $\overrightarrow{JL} = \frac{1}{6}\overrightarrow{IA} + \frac{1}{3}\overrightarrow{IB}$
   c) Deduce that points K , J, and L are collinear .

GOOD WORK!