وزارة التربية والتعليم العالي
المديرية العامة للتربية
دائرة الامتحانات

امتحانات الشهادة الثانوية العامة
الفرع : آداب و إنسانيات

الدورة العادية للعام 2011

عدد المسائل: ثلاث

- مسابقة في مادة الرياضيات
المدة ساعة

الاسم:
الرقم:

ملاحظة: - يسمح باستعمال آلة حاسبة غير قابلة للبرمجة أو اختزان المعلومات أو رسم البيانات.
- يستطيع المرشح الإجابة بالترتيب الذي يناسبه (دون الالتزام بترتيب المسائل الواردة في المسابقة).

I- (5 points)

The price of one kg of sugar and one kg of salt together was 1700 LL.
During an economical crisis, the price of sugar increased by 12% while the price of salt decreased by 15% after which the price of one kg of sugar and one kg of salt together becomes 1769LL.

1) Calculate the initial price of 1 kg of sugar and of 1 kg of salt.
2) A person bought, during the economical crisis, 5 kg of sugar and 2 kg of salt.
Calculate the sum paid by this person.

II-(5 points)

The staff of a medical center consists of 100 employees divided into three categories: doctors, nurses and technicians.
20% of the staff are doctors and 60% are nurses.
80% of the doctors are males and 75% of the nurses are females.
60% of the staff are females.

1) Copy and complete the following table:

	Doctors	Nurses	Technicians	Total
Males				
Females				60
Total	20	60		100

2) A person is chosen randomly from this staff. Calculate the probability of each of the following events:
A : « The chosen person is a female doctor »
B : « The chosen person is a female knowing that she is a doctor »
C : « The chosen person is a female or a doctor »
D : « The chosen person is a male or not a doctor»

3) Suppose that all the names of the staff of this center are written each on a card, and the 100 cards are put in a box. We draw at random, successively and without replacement, two cards from this box.
Determine the probability of drawing two cards carrying the names of two male technicians.

III- (10 points)

Consider the function f defined over $]-\infty ; \frac{1}{2}[\cup]\frac{1}{2} ; +\infty[$ by $f(x) = 2x + 1 + \frac{1}{2x-1}$ and designate by (C) its representative curve in an orthonormal system $(O; \vec{i}, \vec{j})$.

1) Determine $\lim\limits_{\substack{x \to \frac{1}{2} \\ x > \frac{1}{2}}} f(x)$, $\lim\limits_{\substack{x \to \frac{1}{2} \\ x < \frac{1}{2}}} f(x)$ and deduce an asymptote (d) to (C).

2) Calculate $\lim\limits_{x \to +\infty} f(x)$ and $\lim\limits_{x \to -\infty} f(x)$. Show that the straight line (D) with equation y = 2*x* +1 is an asymptote to (C).

3) Show that the point $I\left(\frac{1}{2} ; 2\right)$ is a center of symmetry for (C).

4) a- Verify that f '(*x*) = $\frac{8x(x-1)}{(2x-1)^2}$ and set up the table of variations of f.

b- Draw (d), (D) and (C) .

5) Solve the inequality f (*x*) $\geq$ 0.

6) Consider the two points $A\left(\frac{1}{2} ; 1\right)$ and M(3 ; 0).

The straight line (MA) cuts the axis of ordinates at a point N.

a- Verify that an equation of the straight line (MA) is: $y = -\frac{2}{5}x + \frac{6}{5}$.

b- Calculate the ordinate of N.

c- Verify that $OM \times ON = \frac{1}{2} f(3)$.

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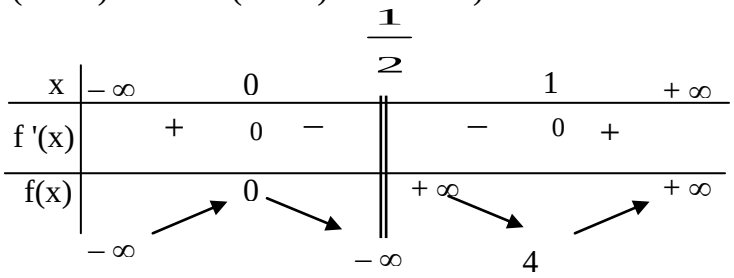
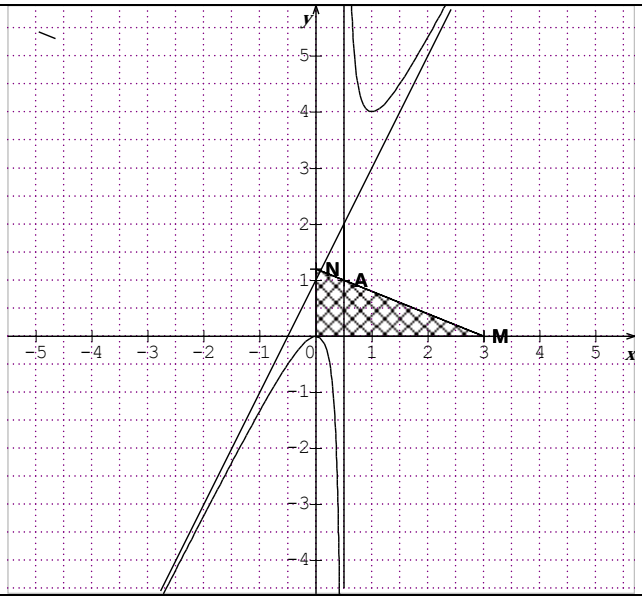
مشروع معيار التصحيح

مسابقة في مادة الرياضيات
المدة ساعة

الاسم:
الرقم:

QI	Answers	Mark
1	Let x be the price of a kg of sugar and y be the price of a kg of salt. $\begin{cases} x+y=1700 \\ 1.12x+0.85y=1769 \end{cases}$ Using a calculator we get x=1200 and y=500. The initial price of a kg of sugar is 1200 LL and that of a kg of salt is 500 LL.	3
2	$5(1.12)(1200)+ 2(0.85)(500)= 7570$ The sum paid by the person is 7570 LL.	2

QII	Answers	Mark
1	<table><tr><td></td><td>Doctors</td><td>Nurses</td><td>Technicians</td><td>Total</td></tr><tr><td>Males</td><td>16</td><td>15</td><td>9</td><td>40</td></tr><tr><td>Females</td><td>4</td><td>45</td><td>11</td><td>60</td></tr><tr><td>Total</td><td>20</td><td>60</td><td>20</td><td>100</td></tr></table>	1.5
2	$P(A)=\frac{4}{100}=0.04, \quad P(B)=\frac{4}{20}=0.2$ P(C) = P(Female or a doctor) = P(Female) + P(doctor) – P(Female and doctor). $=\frac{60}{100}+\frac{20}{100}-\frac{4}{100}=0.76$ p(D) = p(Male or not a doctor) = p(Male) + p(not a doctor) – p(Male and not a doctor) $=\frac{40}{100}+\frac{80}{100}-\frac{24}{100}=\frac{96}{100}=0.96$	2
3	Probability of drawing the names of two male technicians $=\frac{9}{100}\times\frac{8}{99}=\frac{2}{275}=0.0072$	1.5

QIII	Answers	Mark
1	$\lim\limits_{\substack{x\to 1/2\\ x>1/2}} f(x)=+\infty$; $\lim\limits_{\substack{x\to 1/2\\ x<1/2}} f(x)=-\infty$. The of equation $x=\frac{1}{2}$ is an asymptote to (C).	1
2	$\lim\limits_{x\to+\infty} f(x)=+\infty$; $\lim\limits_{x\to-\infty} f(x)=+\infty$ $\lim\limits_{x\to-\infty}\left[f(x)-(2x+1)\right]=\lim\limits_{x\to-\infty}\frac{1}{2x-1}=0$ and $\lim\limits_{x\to+\infty}\left[f(x)-(2x+1)\right]=\lim\limits_{x\to+\infty}\frac{1}{2x-1}=0$. The straight line of equation y = 2x + 1 is an asymptote to (C).	1
3	$f(1-x)+f(x)=2(1-x)+1+\frac{1}{2(1-x)-1}+2x+1+\frac{1}{2x-1}=4+\frac{1}{-2x+1}+\frac{1}{2x-1}=$ $4=2\times 2.$ Then, the point $I(\frac{1}{2};2)$ is a center of symmetry for (C).	1
4a	$f'(x)=2-\frac{2}{(2x-1)^2}=\frac{2(4x^2-4x+1)-2}{(2x-1)^2}=\frac{8x^2-8x}{(2x-1)^2}=\frac{8x(x-1)}{(2x-1)^2}$  f '(x) = 0 for x = 0 or x = 1.	2
4b		2
5	f(x) $\geq$ 0 when (C) is above or on the axis of abscissas which is true for $x>\frac{1}{2}$ or x=0.	0.5
6a	The coordinates of A and of M satisfy the given equation.	1
6b	For x= 0 , $y=\frac{6}{5}$.	1
6b	$OM\times ON=3\times\frac{6}{5}=\frac{18}{5}$ and $\frac{1}{2}f(3)=\frac{1}{2}(7+\frac{1}{5})=\frac{36}{10}=\frac{18}{5}$; then OM×ON=$\frac{1}{2}f(3)$.	0.5