دورة سنة2004الاستثنائية	امتحانات الشهادة الثانوية العامة فرع علوم الحياة	وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات
الاسم : الرقم :	مسابقة في الرياضيات المدة : ساعتان	عدد المسائل : اربع

ملاحظـــة: يُسمح بإستعمال آلة حاسبة غير قابلة للبرمجة أو إختزان المعلومات أو رسم البيانات.
يستطيع المرشح الإجابة بالترتيب الذي يناسبه (دون الالتزام بترتيب المسائل الوارد في المسابقة).

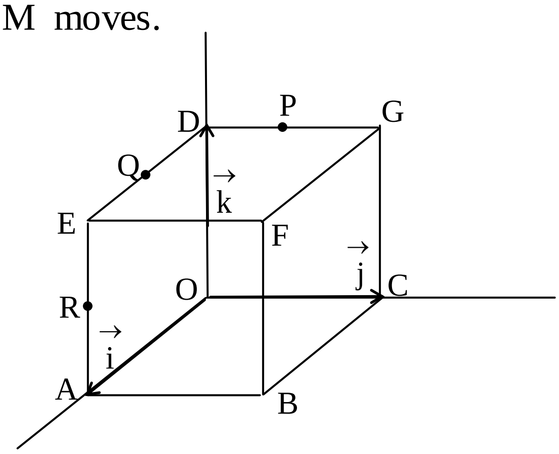
I- (3.5 points).

In the plane referred to a direct orthonormal system $(O;\vec{u},\vec{v})$, consider the points A , B and M of affixes -1 , 4 and z respectively, and let M' be the point of affix z' such that $z' = \dfrac{z-4}{z+1}$ $(z \neq -1)$.

1) In the case where $z = 1+i$, write z' in its algebraic form, and give its exponential form.
2) Determine the values of z for which $z' = z$.
3) a- Give a geometric interpretation of $|z+1|$, and of $|z-4|$.
   b- Find, when $|z'| = 1$, the line on which the point M moves.

II- (3.5 points).

In the space referred to a direct orthonormal system $(O;\vec{i},\vec{j},\vec{k})$, consider the cube OABCDEFG such that : A(1 ; 0 ; 0) , B(1 ; 1 ; 0) and F(1 ; 1 ; 1) . Designate by P, Q and R the midpoints of the segments [DG] , [DE] and [AE] respectively .



1) a-Show that $2x + 2y + 2z - 3 = 0$ is an equation of the plane (PQR).
   b- Prove that the plane (PQR) passes through the midpoint of [AB] .
   c- Prove that the planes (PQR) and (BEG) are parallel.

2) a- What is the nature of quadrilateral EGCA ?
   b- Let M be a variable point on the line (AC) .

   Show that $\overrightarrow{AM} \times \overrightarrow{EF} = \overrightarrow{AM} \times \overrightarrow{GF}$.

III-(4 points).

A multiple choice test is made up of **three** independent questions. The candidate is required to answer all the questions .Each question has two suggested answers out of which only one is correct.

A candidate answers randomly each of these three questions.

1) a- Show that the probability that he answers the three questions correctly is equal to $\frac{1}{8}$.

b- Consider the event E : « Among the three answers of the candidate, exactly two are correct » .
Calculate the probability of E.

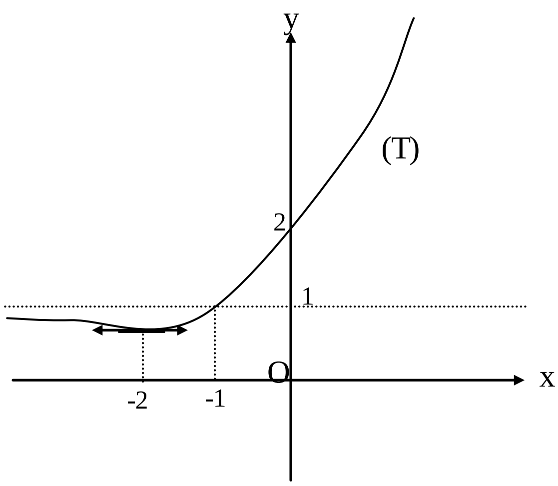
2) The test is marked as follows : **+5** points for each correct answer, and **-3** points for each wrong answer.
Designate by X the random variable that is equal to the total mark obtained by the candidate upon answering the questions of this test.
a- Determine the 4 possible values of X .
b- Determine the probability distribution of X , and calculate the mean (expected value) E (X).

IV-(9 points).

Consider the differential equation (E) : $y'' - 2y' + y = x + 1$.

1) Let $y = z + x + 3$.
a- Write a differential equation (E') satisfied by z, and solve (E').
b- Deduce the general solution of (E).

2) Let f be a particular solution of (E) .
The curve (T) , in the adjacent figure, is the representative curve of the function f ' **the derivative** of f .
Show that $f(x) = xe^{x} + x + 3$.



Designate by (C) ***the representative curve of the function*** f ***in an orthonormal system*** $(O; \vec{i}, \vec{j})$ ***; unit 2cm .***

3) a- Calculate f(1) and $\lim\limits_{x \to +\infty} f(x)$.
b- Calculate $\lim\limits_{x \to -\infty} f(x)$, and show that the line (d) of equation $y = x + 3$ is an asymptote of (C) .
c- Determine, according to the values of x, the relative positions of (C) and (d).
d- Verify that $I\left(-2 ; 1 - \dfrac{2}{e^2}\right)$ is a point of inflection of the curve (C) .

4) a- Verify that f is strictly increasing on IR , and set up its table of variations.
b- Draw (d) and (C).
c- Calculate ,in cm^2, the area of the region bounded by the curve (C), the line (d) and the lines of equations x = 0 and x = 1 .