وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات	امتحانات الشهادة الثانوية العامة فرع علوم الحياة	دورة سنة 2006 العادية

عدد المسائل: اربع	مسابقة في مادة الرياضيات المدة: ساعتان	الاسم: الرقم:

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

I– **(4 points)**

In the space referred to a direct orthonormal system $(O ; \vec{i} , \vec{j} , \vec{k})$, consider the plane (P) of equation $x + y + z - 4 = 0$ and the points A (3 ;1 ; 0) , B(1; 2 ;1) , C(1 ; 1 ;2) and E(2 ; 0 ; –1).

1) Prove that the triangle ABC is right angled at B.
2) a- Verify that the points A, B and C belong to the plane (P).
   b- Write a system of parametric equations of the line (d) that is perpendicular to plane (P) at point A, and verify that the point E belongs to (d).
3) Designate by (Q) the plane that passes through A and is perpendicular to (BE). Write an equation of (Q).
4) The planes (P) and (Q) intersect along a line (D).
   a- Prove that the lines (D) and (BC) are parallel.
   b- M is a variable point on (BC), prove that the distance from M to plane (Q) remains constant.

II– **(4.5 points)**

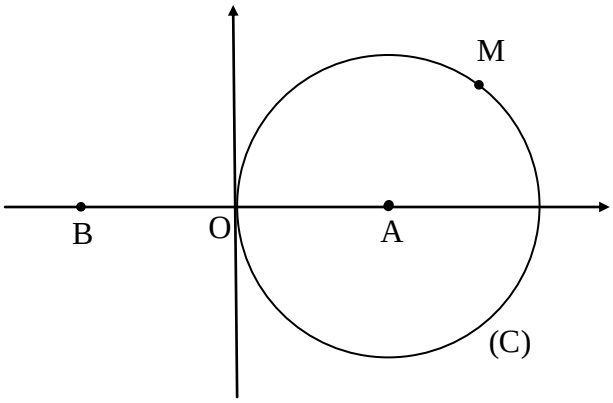
A bag **S** contains **eight** bills: **four** bills of 10 000LL, **three** of 20 000LL and **one** of 50 000LL.
Another bag **T** contains also **eight** bills : **three** bills of 10 000LL and **five** of 20 000LL.

1) **Two bills are drawn, simultaneously and randomly, from the bag S.**
   Calculate the probability of each of the following events:
   A : « the two drawn bills are of the same category »
   B : « the sum of values of the two drawn bills is 30 000LL ».
2) **One of the two bags S and T is randomly chosen, after which two bills are simultaneously and randomly drawn from this bag.**
   Consider the following events:
   E : « the chosen bag is **S** »
   F : « the sum of values of the two drawn bills is 30 000LL »
   Calculate the probabilities $P(F \cap E)$ and $P(F \cap \overline{E})$. Deduce $P(F)$.
3) **We draw, randomly, one bill from the bag S and one bill from the bag T.**
   Let X be the random variable that is equal to the sum of the values of the two drawn bills.
   a- Verify that $P(X = 60\,000) = \frac{3}{64}$.
   b- Determine the probability distribution of X and calculate its mean (expected value).

III– **(3.5 points)**

In the complex plane referred to a direct orthonormal system $(O;\vec{u},\vec{v})$, consider the points A and B of affixes 1 and -1 respectively. Let (C) be the circle of center A and of radius 1. The exponential form of the affix z of a point M on (C), other than O, is given by $z = re^{i\theta}$.

Let M' be the point of affix z' such that $z' = \frac{1}{r}e^{i(\pi+\theta)}$.



1) Show that $z' \times \bar{z} = -1$.
2) Show that the points O, M and M´ are collinear.
3) a- Justify that $|z - 1| = 1$.
   b- Prove that $|z' + 1| = |z'|$, and deduce that M' moves on a line (d) to be determined.
4) Determine the points M on (C) for which $z' = -z$.

IV– **(8 points)**

A- Consider the differential equation (E): $y'' - 4y' + 4y = 4x^2 - 16x + 10$.

Let $z = y - x^2 + 2x$.

1) Write a differential equation (E') satisfied by z.
2) Solve (E') and deduce the general solution of (E) .
3) Determine the particular solution of (E) whose representative curve, in an orthonormal system, has at the point A(0 ;1) a tangent parallel to the axis of abscissas.

B- Let f be the function that is defined on IR by $f(x) = e^{2x} + x^2 - 2x$.

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

1) a- Calculate $\lim\limits_{x\to+\infty} f(x)$ and $\lim\limits_{x\to-\infty} f(x)$.
   b- Calculate f(1) and f(–1.5) in their decimal forms.
2) The table below is the table of variations of the function f ', the derivative of f.

x	$-\infty$		0		$+\infty$
f '(x)	$-\infty$	↗	0	↗	$+\infty$

   a- Determine, according to the values of x , the sign of f '(x) .
   b- Set up the table of variations of f.
3) Draw the curve (C).
4) Let F be the function that is defined on [0 ; + ∞ [by $F(x) = \int_0^x f(t)dt$.
   a- Determine the sense of variations of F.
   b- What is the sign of F(x) ? Justify your answer.