I- (2 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.

N°	Questions	Answers			
		a	b	c	d
1	The particular solution of the differential equation $y' - \frac{1}{2}y=0$, that verifies $y(-2)=1$, is:	$y=-2e^{\frac{x}{2}}$	$y=e^{\frac{x}{2}+1}$	$y=2\cos x - \sin x$	$y=\sqrt{x^2-3}$
2	$f(x)=2\sin(\pi x+2)$. The period of f is: T =	π	2	2π	$\frac{\pi}{2}$
3	The equation $2\ln x = \ln(2x)$ has :	2 roots	One root only	No roots	3 roots
4	If $f(x)=\ln\lvert -3x\rvert$; then $f'(x)=$	$\frac{3}{x}$	$-\frac{3}{x}$	$\frac{1}{\lvert x\rvert}$	$\frac{1}{x}$
5	$e^{\frac{1}{2}\ln 9} \times e^{-\ln\frac{1}{3}} =$	e^3	6	$e^{\frac{3}{2}}$	9
6	$\cos^2(\frac{1}{2}\arccos x) =$	$\frac{1+x}{2}$	$1+\frac{x}{2}$	$\frac{1}{2}x$	$(1+x)^2$

II- (3 points)

Given (C_m): $(m^2-1)x^2+y^2+6my+9=0$.

1) Discuss according to the values of m, the nature of (C_m).
2) Determine the elements of (C_2)(corresponding to m = 2).
3) Find the equations of the tangent and normal to (C_2) at $L(\frac{\sqrt{6}}{3};-1)$.
4) The tangent and normal cut (x'Ox) at T and N.
Calculate $\overline{OT}\times\overline{ON}$.

III-(3 points)

In the complex plane referred to an orthonormal system $(O;\vec{u};\vec{v})$, consider the points A, B, C and D of affixes $z_A = -2i$, $z_B = 4 - 2i$, $z_C = 4 + 2i$ and $z_D = 1$ respectively.

1) Locate the points A, B, C and D and specify the nature of triangle ABC.
2) Let f be the mapping which to every point M of affix z and distinct from A assigns a point M' of affix $z' = \dfrac{z-4-2i}{z+2i}$.
   a) Determine the images of B and C under f.
   b) Determine the set (δ) of points M' of affix z' such that $|z'| = 1$.
3) Prove that for every point M distinct from A and whose image by f is M' we have: M' ≠ D
   $\overrightarrow{DM'}.\overrightarrow{AM} = 4\sqrt{2}$
   $(\vec{u};\overrightarrow{DM'}) + (\vec{u};\overrightarrow{AM}) = \dfrac{5\pi}{4}$ rd.

IV- (3 points)

To encourage national tourism, a tourist agency proposes week-ends of two days, and offers its customers three choices:

- Full-board week-end
- Half-board week-end
- Luxury week-end.

The agency published the following advertisement:

Destination \ Choice	Full-board	Half-board	Luxury
Mountain	150 000 LL	100 000 LL	200 000 LL
Beach	100 000 LL	75 000 LL	150 000 LL

This agency estimates that 65% of its customers choose mountains, and the others choose the beach; and that out of the customers to any destination 55% choose full-board and 30% choose half-board while the others choose luxury week-ends.

A customer is chosen at random and is interviewed.

Consider the following events:

A : « the interviewed customer has chosen the mountains».

B : « the interviewed customer has chosen the beach ».

C : « the interviewed customer has chosen full-board week-end ».

D : « the interviewed customer has chosen half-board week-end ».

S : « the interviewed customer has chosen the luxury week-end ».

1) a- Calculate the following probabilities: $P(A\cap C)$, $P(B\cap C)$ and $P(C)$.

b- The interviewed customer had chosen full-board, what is the probability that he chose the beach?

2) Let X be the random variable that is equal to the amount paid to the agency by a customer.

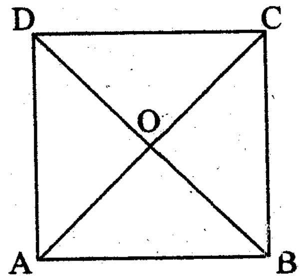
a- Show that $P(X=150\,000) = 0.41$ and determine the probability distribution for X.

b- Calculate the mean(expected value) E(X). What does the number thus obtained represent?

c- Estimate the sum received by this agency when it serves 200 customers.

V- (3 points)

Consider, in an oriented plane, the direct square ABCD with center O such that $(\vec{AB},\vec{AD}) = \frac{\pi}{2}\ (2\pi)$.



Let r be the rotation with center O and angle $\frac{\pi}{2}$ and h be the dilation (homothecy) with center C and ratio 2.

Designate by S the transformation $r \circ h$.

1) Determine the nature of S and specify its ratio and its angle.

2) Designate by W the center of S.

a- Show that $S(C) = D$ and that $S(O) = B$.

b- Construct the point W, specifying clearly the steps of this construction .

3) The plane is referred to an orthonormal system $(A\,;\vec{AB}\,,\vec{AD})$.

a- Write the complex form of S and deduce the affix of the center W.

b- Determine the image of the square ABCD under S .

VI- (6 points)

Part A

Let f be the function defined over IR by $f(x) = \frac{e^{2x}-1}{e^{2x}+1}$.

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

1) Study the parity of f.
2) Show that, for all x ∈ IR, -1 < f(x) < 1.
3) a) Calculate $\lim_{x\to-\infty} f(x)$ and $\lim_{x\to+\infty} f(x)$.
   b) Deduce the equations of the asymptotes to (C).
   c) Study the variations of f and draw its table of variations.
   d) Show that f admits, over IR, an inverse function f^{-1}.
   Determine the domain of definition of f^{-1} and calculate $f^{-1}(x)$.

Part B

1) Determine an equation of the tangent (T) to (C) at the point of (C) of abscissa 0.
2) a) Show that for all numbers t, $f'(t) = 1 - [f(t)]^2$.
   b)Bound f'(t).
   c) For x being positive or zero, bound $\int_0^x f'(t)dt$.
   Justify that $0 \leq f(x) \leq x$ and deduce the relative positions of (C) and (T).
3) B is a point of (C) of positive abscissa, determine B, knowing that the slope of the tangent to (C) at B is $\frac{1}{2}$.
4) Trace (C) and (T).
5) a) Show that f(x) can be written in the form $f(x) = \frac{e^{x}-e^{-x}}{e^{x}+e^{-x}}$.
   b) Calculate the area of the domain limited by (C), the straight line of equation y = x and the two straight lines of equations x = 0 and x = 1.

Good Work