**Exercise 1:**

In the following table, only one of the proposed answers to each question is correct. Write the number of each question and give, with justification, the answer that corresponds to it.

| N | Question | Answers | | |
|---|---|---|---|---|
| | | A | B | C |
| 1) | $\lim\limits_{x\to 0} \frac{1}{x^3 lnx}$ | $+\infty$ | $-\infty$ | 1 |
| 2) | x is a real number.<br>The number of solutions of the equation:<br>$ln^2(x) + 3\ln(x) + 2 = 0$<br>is: | 0 | 1 | 2 |
| 3) | Let f(x)=ln(1-lnx) then f … | is strictly decreasing | is strictly increasing | is not monotonic |
| 4) | $\lim\limits_{x\to +\infty} xln\left(1+\frac{1}{x}\right)$ | $+\infty$ | 0 | 1 |
| 5) | Let f be a function defined on IR by: f(x)=$x^4 - 4x^3 + 6x^2$ then f … | Has a single inflection point | Has a double inflection point | Don't has inflection point |
| 6) | The domain of definition of the function f, such that f(x) = $\ln(4 - x^2)$, is: | $]-\infty;-2[\cup]2;+\infty[$ | ]-2;2[ | $]-\infty;2]\cup[2;+\infty[$ |
| 7) | $\lim\limits_{x\to +\infty} x^3 - xlnx + 2$ | $+\infty$ | +2 | $-\infty$ |

**Exercise2:**

Part (A):

Let g be a function defined over ]0; +∞ [ by: g(x) = 1+x - xln x.

1) Calculate the limits of g(x) at 0 and +∞.

2) Calculate g' (x) then construct the table of variation of g.

3) Show that the equation g(x) = 0 admits a unique solution $\alpha$ and verify that 3.59≤ $\alpha$ ≤ 3.6.

4) Study the of sign of g(x).

Part (B):

Consider the function f defined over ]0; +∞ [ by $f(x)= 1+ \frac{2\ln x}{x+1}$, where (C) is its representative curve in an orthonormal system .

1) Verify that $f(\alpha) = 1 + \frac{2}{\alpha}$

2) Calculate $\lim_{x \to 0} f(x)$. Deduce an asymptote to (C).

3) a. Show that the line (d) of equation y = 1 is an asymptote to (C).

   b. Study the relative position of (C) and (d).

4) Verify that $f'(x) = \frac{2g(x)}{x(x+1)^2}$ and set up the table of variation of f.

5) Determine the equation of (T), the tangent to (C) at a point A of abscissa 1.

6) Draw (d), (T) and (C). (take $\alpha$ = 3.6)