This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

SE02 Exam

15DEC2025

Do NOT write in this box. Your MARK will be placed here.

Subject :	Maths
Class :	12SE
Teacher :	Nicolas Kordahi
Duration :	1 hour
You are to answer the questions to this exam on : Squared paper	

Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

(I) **(3 points)**

For a > 0 simplify:

a- $\ln(3a) - \ln\left(\frac{3}{e}\right)$

b- $\ln(e^3) - \ln(\sqrt{e}) + \ln\left(\frac{1}{e}\right)$

(II) **(5 points)**

The total cost, in millions LL, of the production of x objects is modelled as $C(x) = x^2 - e^{-5x} + 2$, $where\ 0 \leq x < 10$. Find the marginal cost, in millions LL, when 6 objects are produced.

(III) **(12 points)**

Consider the function f defined over $]-\infty, +\infty[$ as $f(x) = x + e^{-x+1}$, and denote by (C) its representative curve in an orthonormal system $(O; \vec{\imath}, \vec{\jmath})$. Let (d) be the line with equation $y = x$.

1) a- Determine $\lim\limits_{x \to +\infty} f(x)$

   b- show that (d) is an oblique asymptote to (C) at $+\infty$

   c- show that (C) is above (d) for all values of x

2) a- Calculate $f'(x)$

   b- Solve $f'(x) = 0$

   c- write an equation of (T) the tangent to (C) at the point of abscissa 1

   d- copy and complete the table of variations of the function f

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

3) a- Calculate $f(-1)\ and\ f(0)$

   b- Draw (d) and (C)

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I- a) $\ln 3a - \ln \frac{3}{e} = \ln 3 + \ln a - (\ln 3 - \ln e)$

$= \ln 3 + \ln a - \ln 3 + 1$

$= \ln a + 1$ (1.5 pts)

b) $\ln e^3 - \ln \sqrt{e} + \ln \frac{1}{e} = 3\ln e - \ln e^{1/2} + \ln 1 - \ln e$

$= 3\ln e - \frac{1}{2}\ln e + 0 - 1$

$= 3 - \frac{1}{2} - 1$

$= \frac{3}{2}$ (1.5 pts)

II- $C(x) = x^2 - e^{-5x} + 2$

$M_c(x) = 2x - (-5)e^{-5x}$

$= 2x + 5e^{-5x}$ (3 pts)

$M(6) = 2(6) + 5e^{-5(6)}$ (2 pts)

$= 12$ then 12,000,000 L.L

III- $f(x) = x + e^{-x+1}$ $\quad]-\infty; +\infty[$

1) a) $\lim_{x \to +\infty} x + e^{-x+1} = +\infty + 0$

$= +\infty$ (1 pt)

b) $\lim_{x \to +\infty} [x + e^{-x+1} - x] = \lim_{x \to +\infty} e^{-x+1}$ (1 pt)

$= e^{-\infty} = 0$ then $y = x$ is an O.A

c) Since $e^{-x+1} > 0$ then (C) above (d) (1 pt)

2) a) $f'(x) = 1 + 0 + (-1)e^{-x+1}$

$= 1 - e^{-x+1}$ → 1 pt

b) $f'(x) = 0 \quad 1 - e^{-x+1} = 0$

$e^{-x+1} = 1$

$-x+1 = \ln 1$

$\boxed{x = 1}$ → 1 pt

c) $x = 1 \quad y = 2 \quad (1,2)$

$f'(x)\big|_{x=1} = 1 - e^{-1+1} = 0$

$y = ax + b$

$2 = a(1) + b \quad b = 2$ → 2 pts

$y = 2$ is the eq. of tangent to (C) at $(1;2)$

d)

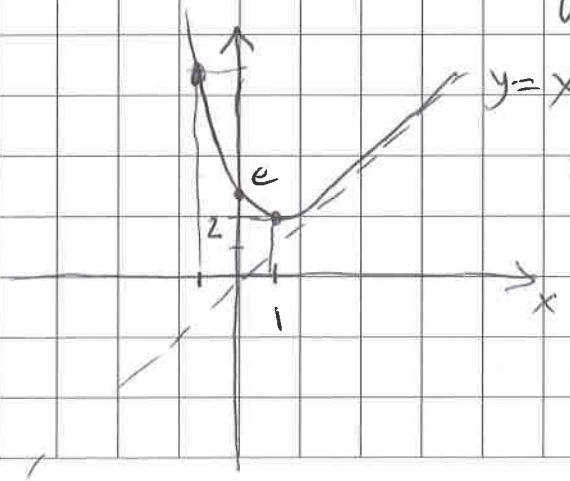
x	$-\infty$		1		$+\infty$
y'		$-$	0	$+$	
y	$+\infty$	↘	$\text{Min}(1;2)$	↗	$+\infty$

→ 2 pts

a) $f(-1) = 6.38$

$f(0) = e = 2.7$ (0.5) (0.5)

b)



2 pts