This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Mock Exams : Pt2

13, 14, 15 JUN2022

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

Subject :	Maths	
Class :	12SE	
Teacher :	Nicolas Kordahi	
Duration :	1 hour	
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.

1) *(7pts)*

A restaurant distributes brochures each month for advertisement.
The table below shows the number of distributed brochures (y_i) in thousands and the monthly cost of distribution (x_i) in hundred thousands LL.

Month	January 2018	February 2018	March 2018	April 2018	May 2018	June 2018
Cost of distribution (x_i) in hundred thousands LL	1	3.5	2	5	1.5	2.4
Number of distributed brochures (y_i) in thousands	1.2	6.4	2.6	7.2	2.1	3.2

1) Find the coordinates of the center of gravity $G(\bar{x}, \bar{y})$.
2) Represent the scatter plot (x_i, y_i) in a rectangular system and plot G.
3) Write an equation of the regression line $(D_{y/x})$ and draw this line in the preceding system.
4) Find the correlation coefficient r and interpret its value.

2) *(13pts)*

Consider the function f defined over the interval $I = [1, +\infty[$ as $f(x) = (10x - 10)e^{-x}$ and denote by (C) its representative curve in an orthonormal system $(O; \vec{i}, \vec{j})$.

Part A

1) Determine $\lim\limits_{x \to +\infty} f(x)$ and deduce an asymptote to (C).
2) Show that $f'(x) = 10(-x + 2)e^{-x}$ and set up the table of variations of f.
3) Draw (C).

Part B

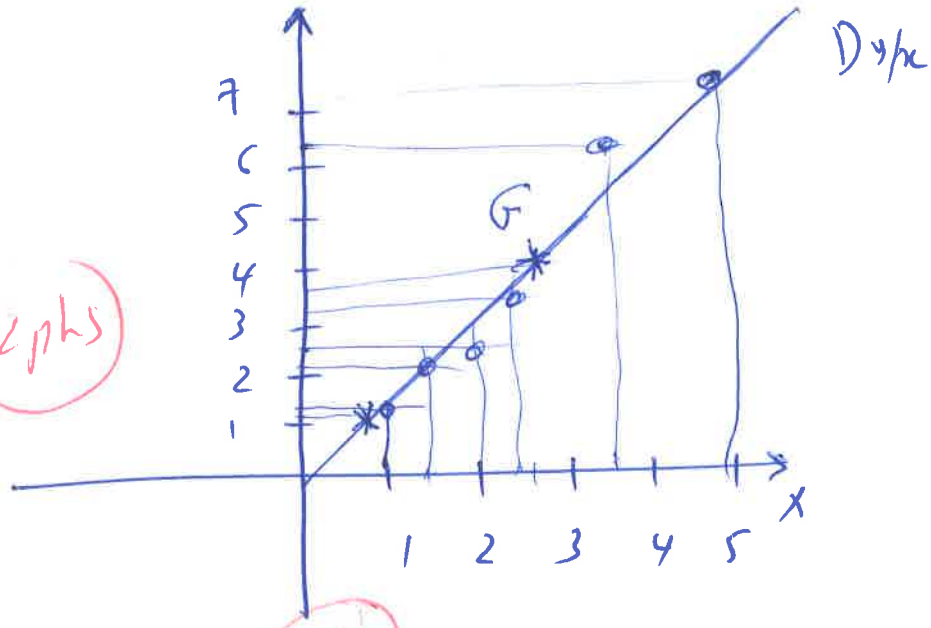
A company produces a certain type of objects.
The demand function f and the supply function g, defined over J = [2 , 10], are respectively modeled as $f(x) = (10x - 10)e^{-x}$ and $g(x) = e^{x-4}$, where f(x) and g(x) are expressed in thousands of objects and the unit price x is expressed in millions of LL. *(The unit price is the price of 1000 objects)*

1) Calculate the number of demanded objects for a unit price of 3 000 000 LL.
2) Find the unit price for a supply of 1 000 objects.
3) The equation f(x) = g(x) has, over J, a unique solution α.
   Suppose that $\alpha = 3.635$.
   a- Give an economical interpretation of α and calculate the corresponding number of objects.
   b- Calculate, in LL, the revenue corresponding to the value of α given above.
4) Denote by E(x) the elasticity of the demand with respect to the unit price x.
   a- Show that $E(x) = \dfrac{x^2 - 2x}{x - 1}$.

I)

1) $G(2.566 ; 3.783)$ (1pt)

2)



(2pts)

3) $y = 1.618x - 0.369$ (2pts)

x	1
y	1.24

4) $r = 0.971$ strong +ve correlation. (2pts)

II - $f(x) = (10x - 10)\, e^{-x}$

1) $\lim\limits_{x \to +\infty} (10x-10)\, e^{-x} = \lim\limits_{x \to +\infty} \left(\dfrac{10x-10}{e^x}\right)$

$= \lim\limits_{x \to +\infty} \dfrac{10}{e^x} = 0$

$y = 0$ H.A (1pt)

2) $f'(x) = u'v + v'u$ $\quad u = 10x - 10$ $\quad u' = 10$

$v = e^{-x}$ $\quad v' = -e^{-x}$

$= 10(e^{-x}) + (-e^{-x})(10x - 10)$

$= 10e^{-x} - e^{-x}(10x - 10)$

$= e^{-x}(20 - 10x)$

$= 10(2 - x)\, e^{-x}$ Vérifié (2 pts)

$f'(x) = 0 \qquad x = 2$

x	1		2		$+\infty$
		$+$	0	$-$	
	0	↗		↘	0

(2 pts)

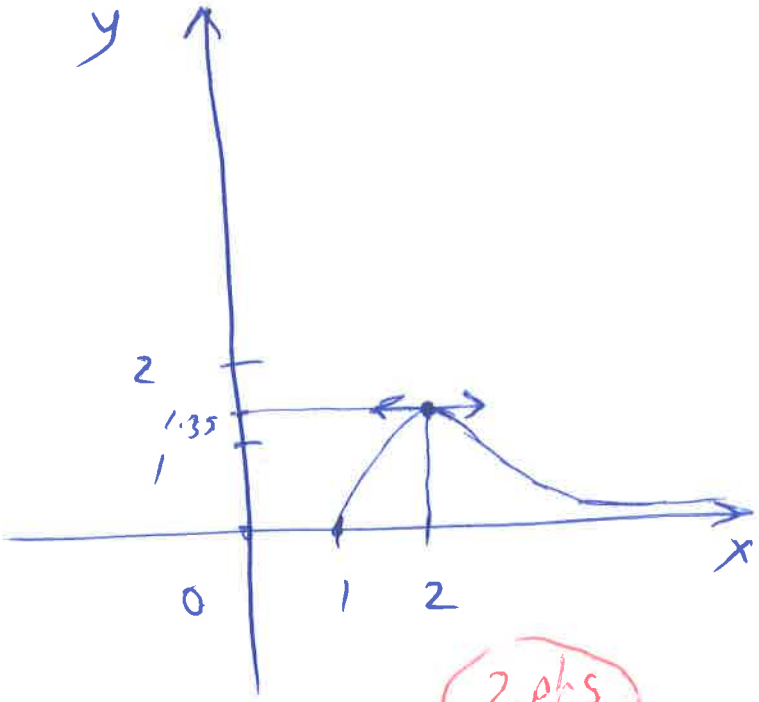
$\max(2;\ 10/e^2)$

$f(1) = (10 - 10)e^{-1}$

$= 0$

$f(2) = (20 - 10)e^{-2} = 10e^{-2} = \frac{10}{e^2} = 1,35$

3)



2 phs

B $f(x) = (10x-10)e^{-x}$ (demand)

$g(x) = e^{x-4}$ (supply)

$f(x) = g(x)$: 1000 ofg

x : 1000,000 L.L

1) $\frac{3,000,000}{1000,000} = 3$

1 ph

$f(3) = 0.995$ then $0.995 \times 1000 = 995$ ofgs.

2) $\frac{1000}{1000} = 1$ $g(x) = 1$

$e^{x-4} = 1$ $x-4 = \ln 1$

$x = 4$

then 4,000,000 L.L

1 ph

3) x is the market eq. price

which is 3,635,000 L.L (1 pt)

a) $b(3.635) = 0.695$ then 0.695×1000

$= 695$ objs.

(1 pt)

b) $R(x) = a\,b(x)$

$= 0.695 \times 3,635,000$ L.L

$= 2,526,325$ L.L (1 pt)

4) $E(x) = \dfrac{-x\,b'(x)}{b(x)} = \dfrac{-x(10)(2-x)e^{-x}}{(10x-10)e^{-x}}$ (1 pt)

$= \dfrac{-x(10)(2-x)}{10(x-1)} = \dfrac{x^2-2x}{x-1}$ Verified

NK