This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Stage Exam 03

10FEB2026

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

Subject :	Maths
Class :	11SE
Teacher :	Mr. George Mouhayar
Duration :	1 hour
Graph paper needed.	

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. Using the definition of the derivative **only**, calculate the derivative of the following function at the point $a = -1$. (3 points)

$$f(x) = 2x^2 - x + 3$$

II. Calculate the derivative of each of the following functions. (10 points)

a) $f(x) = 2x^6 - 3x^3 + \sqrt{x} - \frac{2}{x} + \pi^2$

b) $f(x) = 3(-x^2 + 4)^5$

c) $f(x) = \frac{4x^2 - 3x + 2}{x + 1}$

d) $f(x) = (x^2 - x + 1)(2x + 3)$

III. Consider the function $f(x) = x^3 - 6x^2 + 9x - 4$ and designate by (C) its representative curve in an orthonormal system $(O; \vec{\imath}; \vec{\jmath})$. (17 points)

a) Write the domain of definition of $f(x)$ in an interval form.

b) Find the limits of $f(x)$ at the open bounds of its domain.

c) Calculate the derivative of $f(x)$.

d) Set-up the table of variations of $f(x)$.

e) Determine the coordinates of the x-intercept and the y-intercept.

f) Calculate $f(-1)$ and $f(5)$.

g) Write the equation of the line tangent to (C) at the point A of abscissa 2.

h) Show that the point $I(2, -2)$ is a center of symmetry of (C).

i) On a coordinate system, draw (C) on a graph paper. (Show clearly the particular points)

Solution : SE03 Class 1

11SE Maths 2025/2026

I. $f(x) = 2x^2 - x + 3$ $\quad a = -1$

$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a} \quad (1)$$

$f(-1) = 2(-1)^2 - (-1) + 3$
$= 6$

$$f'(-1) = \lim_{x \to -1} \frac{2x^2 - x + 3 - 6}{x + 1}$$

$$= \lim_{x \to -1} \frac{2x^2 - x - 3}{x + 1}$$

$$= \lim_{x \to -1} \frac{2(x - \frac{3}{2})(x+1)}{(x+1)} \quad (1)$$

$$= \lim_{x \to -1} 2x - 3 \quad (1)$$

$\Rightarrow f'(-1) = -5$

II. a) $f(x) = 2x^6 - 3x^3 + \sqrt{x} - \frac{2}{x} + \sqrt{11}^2$

$f'(x) = 12x^5 - 9x^2 + \frac{1}{2\sqrt{x}} + \frac{2}{x^2}$ (2)

b) $f(x) = 3(-x^2 + 4)^5$

$f'(x) = 15(-x^2+4)^4(-2x)$ (2.5)
$= -30x(-x^2+4)^4$

c) $f(x) = \dfrac{4x^2 - 3x + 2}{x+1}$

$u = 4x^2 - 3x + 2$
$u' = 8x - 3$
$v = x + 1$
$v' = 1$

$f'(x) = \dfrac{u'v - uv'}{v^2}$

$= \dfrac{(8x-3)(x+1) - (4x^2-3x+2)(1)}{(x+1)^2}$

$= \dfrac{8x^2 + 8x - 3x - 3 - 4x^2 + 3x - 2}{(x+1)^2}$

$f'(x) = \dfrac{4x^2 + 8x - 5}{(x+1)^2}$ (3)

d) $f(x) = (x^2 - x + 1)(2x + 3)$

$u = x^2 - x + 1$
$u' = 2x - 1$
$v = 2x + 3$
$v' = 2$

$f'(x) = (2x-1)(2x+3) + (x^2-x+1)(2)$
$= 4x^2 + 6x - 2x - 3 + 2x^2 - 2x + 2$
$= 6x^2 + 2x - 1$ (2.5)

III. $f(x) = x^3 - 6x^2 + 9x - 4$

a) $D_f =]-\infty ; +\infty[$ (0.5)

b) $\lim\limits_{x \to -\infty} f(x) = \lim\limits_{x \to -\infty} (x^3 - 6x^2 + 9x - 4) = \lim\limits_{x \to -\infty} x^3 = -\infty$

$\lim\limits_{x \to +\infty} f(x) = \lim\limits_{x \to +\infty} x^3 = +\infty$ (1.5)

c) $f'(x) = 3x^2 - 12x + 9$ (1.5)

d) $f'(x) = 0$

$3x^2 - 12x + 9 = 0$

$x_1 = 1 \qquad x_2 = 3$

x	$-\infty$		1		3		$+\infty$
$f'(x)$		$+$	0	$-$	0	$+$	
$f(x)$	$-\infty$	↗	max $(1;0)$	↘	min $(3;-4)$	↗	$+\infty$

4

e) x-intercept $\Rightarrow f(x) = 0$

$x^3 - 6x^2 + 9x - 4 = 0$

$x_1 = 1 \qquad x_2 = 4$

$(1;0) \qquad (4;0)$

y-intercept $\Rightarrow x = 0$

$f(0) = -4$

$(0;-4)$

1.5

f) $f(-1) = -20$

$f(5) = 16$

1

g) $f(2) = -2$

$f'(x) = 3x^2 - 12x + 9$

$f'(2) = 3(2)^2 - 12(2) + 9$

$= -3$

$y - f(2) = f'(2)(x - 2)$

$y + 2 = -3(x - 2)$

$y + 2 = -3x + 6$

$y = -3x + 4$

2.5

h) $f(2a - x) + f(x) \stackrel{?}{=} 2b$ $\quad I(2;-2)$ $\quad a=2,\ b=-2$

$f(4 - x) + x^3 - 6x^2 + 9x - 4 \stackrel{?}{=} -4$

$(4-x)^3 - 6(4-x)^2 + 9(4-x) - 4 + x^3 - 6x^2 + 9x - 4$

$64 - 48x + 12x^2 - x^3 - 6(16 - 8x + x^2) + 36 - 9x - 4 + x^3 - 6x^2 + 9x - 4$

$64 - 48x + 12x^2 - x^3 - 96 + 48x - 6x^2 + 36 - 9x - 4 + x^3 - 6x^2 + 9x - 4$

$-4 \stackrel{\checkmark}{=} -4$

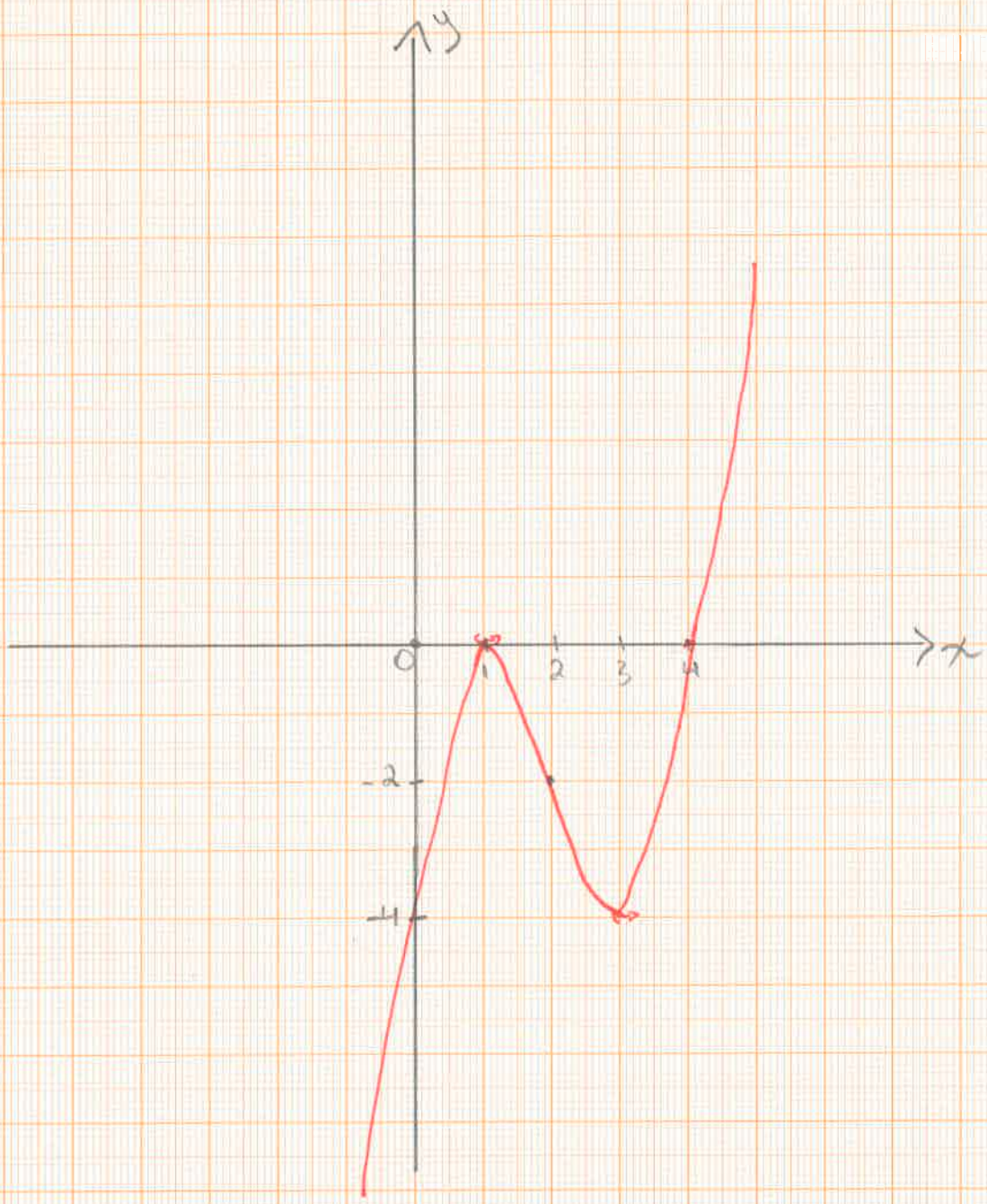
verified

$I(2;-2)$ is a center of symmetry

2.5

i) on the graph paper

2


y
x
0
1
2
3
4
-2
-4