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 :	10B and 10C	
Teacher :	Taline Hawatian	
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.

I.- (7 points)

1) Given the polynomial $P(x) = (m+5)x^3 + (m-4)x^2 + (3m-1)x + 24$. Calculate m so that -2 is a root of $P(x)$.
2) Let $P(x) = 2x^3 - 7x^2 - 10x + 24$.
   a) Show that $(x+2)$ is a factor of $P(x)$.
   b) Let $P(x) = (x+2).Q(x)$. Use long division to determine $Q(x)$.
   c) Factorize $Q(x)$. Write $P(x)$ as a product of three factors.
   d) Solve the equation $P(x) = 0$.

II.- (3 points)

Given the polynomial $P(x) = x^3 + 64$. Verify that -4 is a root of $P(x)$.

Use Horner's method to write $P(x)$ as the product of two factors.

III.-(6 points)

Given a parallelogram ABCD. Let E, F, and H be three points such that: $\overrightarrow{EA} + \overrightarrow{EB} = \vec{0}$,

$\overrightarrow{FD} + 3\overrightarrow{FA} = \vec{0}$, and $2\overrightarrow{HF} + \overrightarrow{HE} = \vec{0}$.

1) Show that $\overrightarrow{AE} = \frac{1}{2}\overrightarrow{AB}$, $\overrightarrow{AF} = \frac{1}{4}\overrightarrow{AD}$, and $\overrightarrow{FH} = \frac{1}{3}\overrightarrow{FE}$.
2) Draw a figure.
3) Write $\overrightarrow{AC}$ as a linear combination of $\overrightarrow{AB}$ and $\overrightarrow{AD}$.
4) Write $\overrightarrow{AH}$ as a linear combination of $\overrightarrow{AB}$ and $\overrightarrow{AD}$.
5) Deduce that A, H, and C are collinear.

IV.-(4 points)

Answer by True or false. Correct the false.

1) The remainder of the division of polynomial $P(x) = 3x^3 - x^2 + 5x - 6$ by $(x-2)$ is 5.
2) If $\overrightarrow{AB} = -2\overrightarrow{BD}$, then D is the midpoint of [AB].
3) If $\|\vec{u}\| = 7$, $\|\vec{v}\| = 4$, and $\|\vec{u} + \vec{v}\| = 3$, then $\vec{u}$ and $\vec{v}$ have the same direction and opposite senses.
4) If $P(x) = (a+3)x^3 - (b-5)x^2 + (a+b-2)x$ is the null polynomial, then $a = b = 0$.

SE03/20252026/Maths/10BC

Ω1- 1) $P(x) = (m+5)x^3 + (m-4)x^2 + (3m-1)x + 24$

-2 is a root of $P(x)$. $\Rightarrow P(-2)=0$

$P(-2) = (m+5)(-8) + (m-4)(4) + (3m-1)(-2) + 24$ 1

$= -8m - 40 + 4m - 16 - 6m + 2 + 24 = -10m - 30$

$P(-2)=0 \quad -10m - 30 = 0 \quad -10m = 30 \quad m = -3$

2) $P(x) = 2x^3 - 7x^2 - 10x + 24$

a) $P(-2) = 2(-8) - 7(4) - 10(-2) + 24 = -16 - 28 + 20 + 24 = 0$ 0.5

$\Rightarrow -2$ is a root of $P(x)$. $(x+2)$ is a factor of $P(x)$.

b) $P(x) = (x+2) \cdot Q(x)$

$$\begin{array}{r|l} & 2x^2 - 11x + 12 \\ \hline x+2 & 2x^3 - 7x^2 - 10x + 24 \\ \ominus & 2x^3 \oplus 4x^2 \\ \hline & -11x^2 - 10x \\ & \oplus 11x^2 \oplus 22x \\ \hline & 12x + 24 \\ & \ominus 12x \oplus 24 \\ \hline & 0 \end{array}$$ 1.5

$P(x) = (x+2)(2x^2 - 11x + 12)$ 0.5

c) $Q(x) = 2x^2 - 11x + 12$.

$Q(4) = 2(16) - 11(4) + 12 = 32 - 44 + 12 = 0$. 0.5

4 is a root of $Q(x)$. $(x-4)$ is a factor of $Q(x)$.

	2	-11	12
4	0	8	-12
	2	-3	0

1

$Q(x) = (x-4)(2x-3)$ 0.5

$P(x) = (x+2)(x-4)(2x-3)$ 0.5

d) $P(x) = 0 \quad (x+2)(x-4)(2x-3) = 0$

$x+2=0 \quad x-4=0 \quad 2x-3=0$ 1

$x=-2 \quad x=4 \quad 2x=3$

$x = \frac{3}{2}$

II.- $P(x) = x^3 + 64$

$P(-4) = (-4)^3 + 64 = -64 + 64 = 0$ 0.5

$\Rightarrow -4$ is a root of $P(x)$. $(x+4)$ is a root of $P(x)$.

(-4)	x^3	x^2	x	constant
	1	0	0	64
	0	-4	16	-64
	1	-4	16	0

2

$P(x) = (x+4)(x^2 - 4x + 16)$ 0.5

III.- $\vec{EA} + \vec{EB} = \vec{0}$, $\vec{FD} + 3\vec{FA} = \vec{0}$, $2\vec{HF} + \vec{HE} = \vec{0}$

1) $\vec{EA} + \vec{EB} = \vec{0}$

$-\vec{AE} + \vec{EA} + \vec{AB} = \vec{0}$

$-\vec{AE} - \vec{AE} + \vec{AB} = \vec{0}$ 0.5

$-2\vec{AE} = -\vec{AB}$

$\vec{AE} = \frac{1}{2}\vec{AB}$

$\vec{FD} + 3\vec{FA} = \vec{0}$

$\vec{FA} + \vec{AD} - 3\vec{AF} = \vec{0}$ 0.75

$-4\vec{AF} = -\vec{AD}$

$\vec{AF} = \frac{1}{4}\vec{AD}$

$2\vec{HF} + \vec{HE} = \vec{0}$

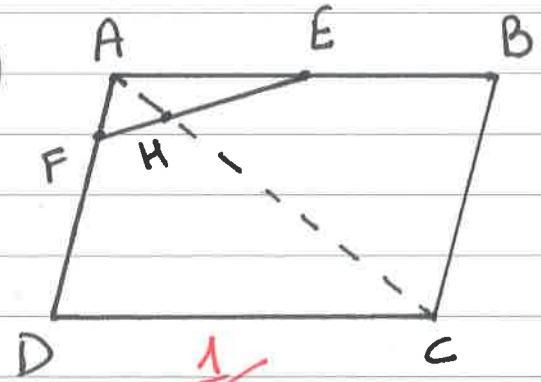
$2\vec{HF} + \vec{HF} + \vec{FE} = \vec{0}$ 0.75

$3\vec{HF} = -\vec{FE}$

$-3\vec{FH} = -\vec{FE}$

$\vec{FH} = \frac{1}{3}\vec{FE}$

2)



1

3) $\vec{AC} = \vec{AB} + \vec{AD}$ 0.5

4) $\vec{AH} = \vec{AF} + \vec{FH}$

$= \vec{AF} + \frac{1}{3}\vec{FE}$

$= \vec{AF} + \frac{1}{3}\vec{FA} + \frac{1}{3}\vec{AE}$ 1.5

$= \frac{2}{3}\vec{AF} + \frac{1}{3}\left(\frac{1}{2}\vec{AB}\right)$

$= \frac{2}{3}\left(\frac{1}{4}\vec{AD}\right) + \frac{1}{6}\vec{AB}$

$= \frac{1}{6}\vec{AD} + \frac{1}{6}\vec{AB}$

5) $\overrightarrow{AH} = \frac{1}{6}\overrightarrow{AD} + \frac{1}{6}\overrightarrow{AB}$

$= \frac{1}{6}(\overrightarrow{AD} + \overrightarrow{AB}) = \frac{1}{6}\overrightarrow{AC}$. 0.5

$\overrightarrow{AH} = \frac{1}{6}\overrightarrow{AC}$ $\Rightarrow$ (AH) and (AC) have the same direction
But A is a common point. 0.5
Therefore A, H, C are collinear points.

IV- 1) False $R = P(2) = 3(8) - 4 + 5(2) - 6$ 1
$= 24$.

2) False $\overrightarrow{AB} = -2\overrightarrow{BD}$
$\overrightarrow{AB} = 2\overrightarrow{DB}$
$\overrightarrow{AB} = 2\overrightarrow{DA} + 2\overrightarrow{AB}$ 1
$-\overrightarrow{AB} = -2\overrightarrow{AD}$ $\overrightarrow{AB} = 2\overrightarrow{AD}$
D is the midpt. of [AB].

3) True 1

4) False $P(x)$ is null. 1
$\Rightarrow$ $a+3=0$ $b-5=0$ $a+b-2=0$
$a=-3$ $b=5$ $-3+5-2=0$ verified.