This is a Class 1 exam

Lebanon Evangelical School for Boys and Girls

Lebanon Evangelical School

for Boys and Girls — Loueizeh - Baabda

Stage Exam 05

12MAY2023

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.- (8 pts)

Solve the following inequalities and write the solution set as an interval if possible.

1) $\frac{(7-x)}{(7-3x)(2x-4)^2} \geq 0$

2) $\left|\frac{7x+11}{5-8x}\right| < 1$

3) $\frac{3x^2+5x-18}{(x-3)(x+3)} \leq 2$

II.- (6 pts)

Solve the following system of inequalities:

$$\begin{cases} \frac{2x+11}{6} - \frac{8-3x}{10} < 0.5 \\ |5-3x| \geq 3 \end{cases}$$

III.- (2 points)

Tom is deciding whether or not he should become a gym member to use their basketball courts. The membership cost is \$135. Members pay \$2 to rent out the basketball courts. Non-members can rent the court also, but they have to pay \$11 each time. How many times would Tom need to rent the court in order for it be cheaper to be a member than a non-member?

IV.- (8 pts)

Given in an orthonormal system $(O;\ \vec{\imath};\ \vec{\jmath})$, the points N(2; 3), P(1; −2), and R(−1; 1.5) and the vector $\vec{v} = -3\vec{\imath} + \vec{\jmath}$.

1) K is a point defined by $\overrightarrow{KR} = 4\overrightarrow{NP} - 2\overrightarrow{NK}$. Determine the coordinates of K.
2) Consider the point A$(m; 5)$. Calculate m so that the vectors $\overrightarrow{AR}$ and $\vec{v}$ are collinear.
3) Consider the point E$(x; y)$. Find a relation between x and y so that points E, N, P are collinear.
4) Calculate the coordinates of the centroid G of triangle NPR.
5) Determine the coordinates of point O, R, P in the system $(N;\ \vec{\imath};\ \vec{\jmath})$. Calculate the components of the vector $\overrightarrow{PR}$ in $(N;\ \vec{\imath};\ \vec{\jmath})$ and compare to its components in $(O;\ \vec{\imath};\ \vec{\jmath})$.

SE05/20222023/Maths/10BC

I- 1) $\frac{(7-x)}{(7-3x)(2x-4)^2} \geq 0$ $\quad 7-x=0 \quad x=7$

$7-3x\neq 0 \quad -3x\neq -7 \quad x\neq \frac{7}{3}$ 0.5

$2x-4\neq 0 \quad 2x\neq 4 \quad x\neq 2$

x	$-\infty$		0		2		7/3		7		$+\infty$
$\frac{(7-x)}{(7-3x)(2x-4)^2}$		+		+	‖	+	‖	−	0	+	
					even		odd		odd		

1 0.5

$S=]-\infty;2[\cup]2;\frac{7}{3}[\cup[7;+\infty[$

2) $\left|\frac{7x+11}{5-8x}\right| < 1 \iff \frac{|7x+11|}{|5-8x|} < 1 \quad 5-8x\neq 0$ $\quad x\neq \frac{5}{8}$ 0.5

$|7x+11| < |5-8x|$

$\iff (7x+11)^2 < (5-8x)^2$ 0.5

$(7x+11)^2-(5-8x)^2<0$

$(7x+11-5+8x)(7x+11+5-8x)<0$ 0.5

$(15x+6)(-x+16)<0$

$15x+6=0 \quad x=-\frac{6}{15}=\frac{-2}{5} \quad -x+16=0 \quad x=16$

x	$-\infty$		$-2/5$		0		16		$+\infty$
$(15x+6)(-x+16)$		−	0	+		+	0	−	
			odd				odd		

1 0.5

$S=]-\infty;\frac{-2}{5}[\cup]16;+\infty[$

3) $\frac{3x^2+5x-18}{(x-3)(x+3)} \leq 2$

$x=0 \quad x+5=0 \quad x=-5$

$x-3\neq 0 \quad x\neq 3 \quad x+3\neq 0 \quad x\neq -3$

$\frac{3x^2+5x-18}{x^2-9}-2\leq 0$

$\frac{3x^2+5x-18-2x^2+18}{x^2-9}\leq 0$

$\frac{x^2+5x}{x^2-9}\leq 0$ 1

$\frac{x(x+5)}{(x-3)(x+3)}\leq 0$

0.5

x	$-\infty$		-5		-3		0	1	3	$+\infty$
$\frac{x(x+5)}{(x-3)(x+3)}$	+	0	−	‖	+	0	−	‖	+	
		odd		odd		odd		odd		

1

$S=[-5;-3[\cup[0;3[$ 0.5

II. $\begin{cases} \frac{2x+11}{6} - \frac{8-3x}{10} < 0.5 \quad \ldots (1) \\ |5-3x| \geq 3 \quad \ldots\ldots (2) \end{cases}$

(1): $\frac{2x+11}{6} - \frac{8-3x}{10} < 0.5$

$\frac{10x+55-24+9x}{30} < \frac{15}{30}$ ✓1

$19x + 31 < 15$

$19x < 15-31$ ✓1

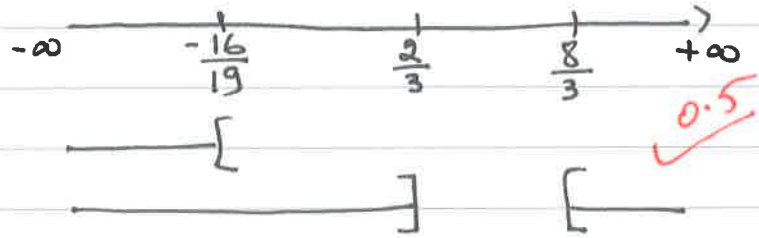
$19x < -16 \qquad x < -\frac{16}{19} \qquad S_1 =]-\infty; \frac{-16}{19}[$

(2): $|5-3x| \geq 3$

$5-3x \leq -3$ or $5-3x \geq 3$ ✓1

$-3x \leq -8$ ✓1 $\qquad -3x \geq -2$ ✓1

$x \geq \frac{8}{3} \qquad x \leq +\frac{2}{3} \qquad S_2 =]-\infty; \frac{2}{3}] \cup [\frac{8}{3}; +\infty[$



✓0.5 ✓0.5

$S =]-\infty; \frac{-16}{19}[$

III. Let x be the number of times that Tom will rent the court

$135 + 2x < 11x$ ✓1

$2x - 11x < -135 \qquad -9x < -135 \qquad x > 15$ ✓1

Tom must rent the court more than 15 times.

IV. $N(2;3) \quad P(1;-2) \quad R(-1;1.5) \quad \vec{v} = -3\vec{i} + \vec{j}$

1) $\vec{KR} = 4\vec{NP} - 2\vec{NK}$

$\vec{OR} - \vec{OK} = 4(\vec{OP} - \vec{ON}) - 2(\vec{OK} - \vec{ON})$ ✓1

$\vec{OR} - \vec{OK} = 4\vec{OP} - 4\vec{ON} - 2\vec{OK} + 2\vec{ON}$

$-\vec{OK} + 2\vec{OK} = 4\vec{OP} - 2\vec{ON} - 2\vec{OR}$

$\vec{OK} = 4\vec{i} - 8\vec{j} - 4\vec{i} - 6\vec{j} + \vec{i} - 1.5\vec{j}$

$\vec{OK} = \vec{i} - \frac{31}{2}\vec{j}$ $\quad K\left(1; -\frac{31}{2}\right)$ ✓1

2) $A(m; 5)$ $\quad \vec{AR} \begin{cases} x_R - x_A = -1 - m \\ y_R - y_A = 1.5 - 5 = -3.5 \end{cases}$ $\quad \vec{u}(-3; 1)$

$\vec{AM}$ and $\vec{v}$ are collinear. $\quad xy' - yx' = 0$

$(-1-m)(1) - (-3.5)(-3) = 0$ ✓1.5

$-1 - m - 10.5 = 0$

$m = -11.5$

3) $E(x; y)$

$\vec{WE}(x-2; y-3)$ $\quad \vec{NP}(-1; -5)$

E, N, P are collinear.

$\Rightarrow$ $\vec{NE}$ and $\vec{NP}$ are collinear.

$xy' - yx' = 0$ $\quad -5(x-2) - (-1)(y-3) = 0$ ✓1.5

$-5x + 10 + y - 3 = 0$

$-5x + y + 7 = 0$.

4) $x_G = \frac{x_N + x_P + x_R}{3} = \frac{2 + 1 - 1}{3} = \frac{2}{3}$

$y_G = \frac{y_N + y_P + y_R}{3} = \frac{3 - 2 + 1.5}{3} = \frac{2.5}{3} = \frac{5}{6}$ $\quad G\left(\frac{2}{3}; \frac{5}{6}\right)$ ✓1

5) $X_O = x_O - x_N = 0 - 2 = -2$

$Y_O = y_O - y_N = 0 - 3 = -3$ $\quad O(-2; -3)$ ✓0.5

$X_R = x_R - x_N = -3$

$Y_R = y_R - y_N = -1.5$ $\quad R(-3; -1.5)$ ✓0.5

$x_P = x_P - x_N = -1$

$y_P = y_P - y_N = -5$ $\quad P(-1; -5)$ ✓0.5

is $(O; \vec{i}, \vec{j})$ $\quad \vec{PR} \begin{cases} x_R - x_P = -1 - 1 = -2 \\ y_R - y_P = 1.5 + 2 = 3.5 \end{cases}$ $\quad \vec{PR}(-2; 3.5)$

is $(N; \vec{i}, \vec{j})$ $\quad \vec{PR} \begin{cases} x_R - x_P = -3 + 1 = -2 \\ y_R - y_P = -1.5 + 5 = 3.5 \end{cases}$ $\quad \vec{PR}(-2; 3.5)$ ✓0.5

They have the same components.