This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Stage Exam 04

12FEB2024

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.- (6 points)

Solve the following equations:

1) $\frac{343^{-x}}{7^{3-2x}} = 49^{3x+1}.\sqrt{7}$

2) $13 - 2|-3x + 13| = 7$

3) $3\sqrt{4x^2 + 1} = 5x + 3$

II.- (4 pts)

Discuss and solve the following equation where m is a real parameter.

$$m^2(3x - 1) + 16 = 2x(m^2 + 2m)$$

III.- (8 points)

Solve the following system of inequalities:

$$\begin{cases} |7 - 3x| \geq |5x - 2| \\ \frac{x^2+7x+18}{(x-3)^2} \leq 2 \end{cases}$$

IV.- (3 points)

Sam has three times as much money as John. If Sam gives John $50, John will then have three times as much money as Sam. How much money do the two of them have together?

V.- (4 points)

1) Calculate the radius of a circle, If the length of an arc $\propto = \frac{5\pi}{4} rad$ is 12cm.

2) Determine the principal measure of the following arcs:

a) $\propto = \frac{43\pi}{5}$ rad. b) $\propto = -640°$

SE04/20232024/Maths/10BC

I- 1) $\frac{343^{-x}}{7^{3-2x}} = 49^{3x+1} \cdot \sqrt{7}$

$\frac{(7^3)^{-x}}{7^{3-2x}} \times \frac{(7^2)^{3x+1} \cdot 7^{\frac{1}{2}}}{1}$ 0.5

$7^{-3x} = 7^{3-2x} \cdot 7^{6x+2} \cdot 7^{\frac{1}{2}}$ 0.5

$7^{-3x} = 7^{4x+\frac{11}{2}}$

$-3x = 4x + \frac{11}{2}$

$-3x - 4x = \frac{11}{2}$

$-7x = \frac{11}{2}$ $x = \frac{-11}{14}$ 0.5

2) $13 - 2|-3x+13| = 7$

$-2|-3x+13| = 7 - 13$ 0.5

$|-3x+13| = \frac{-6}{-2} = 3$

$-3x+13 = 3$ or $-3x+13 = -3$

$-3x = -10$ 0.75 $-3x = -16$ 0.75

$x = \frac{10}{3}$ $x = \frac{16}{3}$

3) $3\sqrt{4x^2+1} = 5x+3$

$4x^2+1 > 0$ for all x in $\mathbb{R}$

$5x+3 \geq 0$ $x \geq \frac{-3}{5}$ 0.5

Square both sides 0.5

$9(4x^2+1) = (5x+3)^2$

$36x^2+9 = 25x^2+30x+9$

$36x^2+9-25x^2-30x-9 = 0$ 0.5

$11x^2 - 30x = 0$

$x(11x-30) = 0$ 0.5

$x = 0$ accepted 0.5

$11x - 30 = 0$ $11x = 30$ $x = \frac{30}{11}$ accepted 0.5

II.- $m^2(3x-1)+16=2x(m^2+2m)$

$3m^2x-m^2+16=2m^2x+4mx$

$3m^2x-2m^2x-4mx=m^2-16$

$m^2x-4mx=(m-4)(m+4)$ 1

$m(m-4)x=(m-4)(m+4)$

if $m=0$ $0x=-16$ no solution $S=\phi$ 1

if $m=4$ $0x=0$ $S=\mathbb{R}$ 1

if $m\neq 0$ and $m\neq 4$ $x=\dfrac{(m-4)(m+4)}{m(m-4)}=\dfrac{m+4}{m}$ $S=\left\{\dfrac{m+4}{m}\right\}$ 1

III.- $\begin{cases} |17-3x| \geq |5x-2| \ldots\ldots (1) \\ \dfrac{x^2+7x+18}{(x-3)^2} \leq 2 \ldots\ldots (2) \end{cases}$

(1): $|17-3x| \geq |5x-2| \iff (7-3x)^2 \geq (5x-2)^2$ 0.5

$(7-3x)^2-(5x-2)^2 \geq 0$

$[(7-3x)-(5x-2)][(7-3x)+(5x-2)] \geq 0$

$(7-3x-5x+2)(7-3x+5x-2) \geq 0$ 1

$(9-8x)(2x+5) \geq 0$ 0.5

$9-8x=0 \quad x=\dfrac{9}{8} \qquad 2x+5=0 \quad x=\dfrac{-5}{2}$ 1

	$-\infty$		$-5/2$		0		$9/8$		$+\infty$
$(-8x+9)(2x+5)$		$-$	ϕ	$+$		$+$	ϕ	$-$	

$S_1=\left[-\dfrac{5}{2};\dfrac{9}{8}\right]$ 0.5

(2): $\dfrac{x^2+7x+18}{(x-3)^2} \leq 2 \qquad x\neq 3$

$\dfrac{x^2+7x+18}{(x-3)^2}-2\leq 0$ 0.5

$\dfrac{x^2+7x+18-2(x^2-6x+9)}{(x-3)^2} \leq 0$

$\dfrac{x^2+7x+18-2x^2+12x-18}{(x-3)^2} \leq 0$ 1

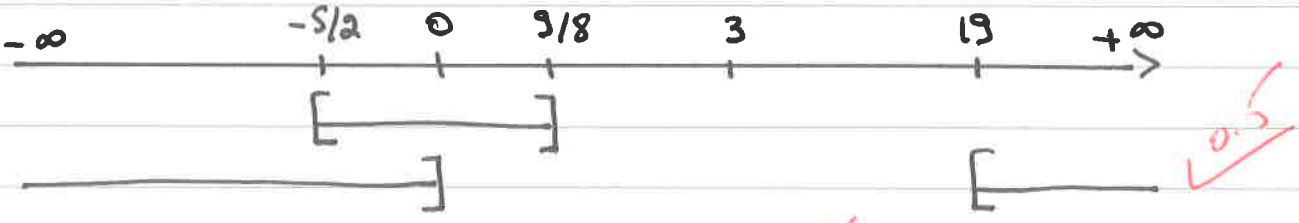
$\dfrac{-x^2+19x}{(x-3)^2} \leq 0 \qquad \dfrac{-x(x-19)}{(x-3)^2} \leq 0$

2

x	$-\infty$		0		3		19		$+\infty$
$\frac{-x(x-19)}{(x-3)^2}$		$-$	ϕ	$+$	$\|\|$	$+$	ϕ	$-$	

1.5

$S_2 =]-\infty; 0] \cup [19; +\infty[$ 0.5



0.5

$S = S_1 \cap S_2 = \left[-\frac{5}{2}; 0\right]$ 0.5

IV. Let x be the amount of money John has. Sam has $3x$.

$x + 50 = 3(3x - 50)$ 1

$x + 50 = 9x - 150$

$9x - x = 50 + 150 \quad 8x = 200$ 1 $\quad x = \frac{200}{8} = 25$

$3x = 3(25) = 75$ 0.5

John has \$25 and Sam \$75. Together they have \$100. 0.5

V. 1) $\alpha = \frac{5\pi}{4}$ rad $\quad l = 12$ cm $\quad l = r\alpha$

$r = \frac{l}{\alpha} = \frac{12}{\frac{5\pi}{4}} = \frac{48}{5\pi} = 3.056$ cm 1

2) a) $\alpha = \frac{43\pi}{5} = \frac{40\pi}{5} + \frac{3\pi}{5} = 8\pi + \frac{3\pi}{5}$ 1.5

The principal measure of the arc is $\frac{3\pi}{5}$ rad.

b) $\alpha = -640° = -2 \times 360° + 80°$ 1.5

The principal measure of the arc is $80°$.