KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF SCIENCE

FACULTY OF PHYSICAL AND COMPUTATIONAL SCIENCES

DEPARTMENT OF MATHEMATICS

CALCULUS WITH ANALYSIS

TUTORIAL **MAY 2021**

1. Solve the following equations. Find the sum of the solutions of equations 7) to 9).

$$1)\ 2\left|\frac{4x}{3}-1\right|=1 \qquad 2)\ -3\left|\frac{3x}{2}-\frac{2}{3}\right|=-3 \qquad 3)\ \frac{3\left|x-\frac{3}{4}\right|}{2}=0$$

$$4)\ \left|\frac{x}{2}-1\right|=-\frac{2}{3} \qquad 5)\ \frac{2}{3}\left|\frac{3x}{2}+\frac{1}{2}\right|=\frac{1}{2} \qquad 6)\ 3\left|\frac{4x}{3}+\frac{3}{2}\right|=-\frac{1}{2}$$

$$7)\ |2x+3|=\frac{1}{3} \qquad 8)\ -\frac{4\left|\frac{3x}{2}+2\right|}{3}=4 \qquad 9)\ -\frac{\left|\frac{x}{2}+2\right|}{4}=-3$$

2. Solve the following inequations

$$1)\ -\frac{\left|\frac{x}{4}+\frac{1}{3}\right|}{3}\geq -2 \qquad 2)\ 2\left|4x+\frac{1}{4}\right|\leq\frac{1}{3} \qquad 3)\ -\left|4x+\frac{3}{2}\right|\geq -\frac{3}{4}$$

$$4)\ -3\left|\frac{4x}{3}+\frac{1}{4}\right|>-\frac{1}{4} \qquad 5)\ \left|\frac{x}{4}-3\right|-2<0 \qquad 6)\ \frac{\left|2x-\frac{3}{4}\right|}{2}<-\frac{3}{4}$$

$$7)\ -\frac{|4x+4|}{3}-\frac{2}{3}\geq 0 \qquad 8)\ -2+2\left|\frac{3x}{4}-3\right|<4 \qquad 9)\ 2\left|4x-\frac{2}{3}\right|-\frac{2}{3}<0$$

3. Solve the following inequations

$$1)\ -3\left|3x-\frac{1}{2}\right|\leq -\frac{1}{3} \qquad 2)\ \frac{|3x+1|}{3}\geq 2 \qquad 3)\ -\frac{3\left|\frac{3x}{2}+\frac{2}{3}\right|}{4}\leq\frac{1}{4}$$

$$4)\ \frac{2\left|\frac{2x}{3}-\frac{3}{2}\right|}{3}>\frac{4}{3} \qquad 5)\ -\frac{2\left|\frac{2x}{3}+2\right|}{3}<\frac{4}{3} \qquad 6)\ \frac{4}{3}-\frac{3\left|3x+\frac{3}{4}\right|}{2}<0$$

$$7)\ \frac{|2x+4|}{2}-1\geq 0 \qquad 8)\ \left|\frac{x}{2}+\frac{1}{3}\right|-1>0 \qquad 9)\ \frac{1}{3}-\left|4x+\frac{3}{4}\right|<-1$$

4. Find $I_1 \cap I_2$, $I_1 - I_2$, and $\mathbb{R} - I_2$.

1) $I_1 = \{x \in \mathbb{R} : |3x+2| \leq 15\}$ and $I_2 = \{x \in \mathbb{R} : |1-x+2| < 4\}$.

2) $I_1 = \left\{x \in \mathbb{R} : -\left|\frac{4x}{3} - 1\right| > -\frac{1}{3}\right\}$ and $I_2 = \left\{x \in \mathbb{R} : -\left|2x - \frac{4}{3}\right| \geq -4\right\}$.

3) $I_1 = \left\{x \in \mathbb{R} : \left|-x - \frac{4}{3}\right| > 2\right\}$ and $I_2 = \left\{x \in \mathbb{R} : \left|x - \frac{2}{3}\right| - 3 \leq 4\right\}$.

4) $I_1 = \{x \in \mathbb{R} : |x+4| \geq 4\}$ and $I_2 = \{x \in \mathbb{R} : -|3x+2| + 3 \geq 0\}$.

5) $I_1 = \left\{x \in \mathbb{R} : 1 + \left|-\frac{1}{4} + \frac{x}{2}\right| < 2\right\}$ and $I_2 = \left\{x \in \mathbb{R} : -3 + 4\left|-\frac{x}{3} - 3\right| > 0\right\}$.

6) $I_1 = \{x \in \mathbb{R} : |-x+1| - 5 \leq 0\}$ and $I_2 = \left\{x \in \mathbb{R} : \left|\frac{x}{4} - 2\right| - 2 \geq 0\right\}$.

5. Solve the following equations

1) $2\left|\frac{4x}{3} + \frac{1}{4}\right| - \left|\frac{x}{2} - 4\right| = 1$

2) $\left|\frac{x}{4} - 2\right| - \left|\frac{x}{2} + 3\right| = -\frac{1}{4}$

3) $\left|3x - \frac{4}{3}\right| + 4|x-1| = \frac{2}{3}$

4) $|3x-1| - |4x+1| = -\frac{4}{3}$

5) $\left|3x - \frac{2}{3}\right| + \left|\frac{3x}{2} - 3\right| = 4$

6) $-|x-4| - |2x-3| = -\frac{1}{4}$

7) $\left|\frac{x}{4} + \frac{1}{3}\right| + \left|\frac{x}{2} + \frac{3}{4}\right| = -1$

8) $\left|3x + \frac{2}{3}\right| - |2x+4| = -2$

6. Find the isolated and/or the limit points of the following sets:

1) $S = (-1, 1)$

2) $S = [2, 5]$

3) $S = (-3, 1) \cup (1, 3]$

4) $S = (-5, -2) \cup \{1\} \cup \left[\frac{3}{2}, 3\right]$

5) $S = \left(0, \frac{1}{2}\right) \cup \{1\} \cup \left\{1 - \frac{1}{n}, n \in \mathbb{N}\right\}$

6) $S = \mathbb{Z}$.

AKA