SN ________ ID ______________ NAME ____

Show all necessary steps for full marks.

Question 1: (5 points): (1.7 Exercise 24): Find the solution set of $-\frac{2}{3}x-\frac{1}{6}x+\frac{2}{3}(x+1)\le\frac{4}{3}$.

Solution:

24.

$$-\frac{2}{3}x-\frac{1}{6}x+\frac{2}{3}(x+1)\le\frac{4}{3}$$

$$(-6)\left[-\frac{2}{3}x-\frac{1}{6}x+\frac{2}{3}(x+1)\right]\ge(-6)\left[\frac{4}{3}\right]$$

$$4x+x-4(x+1)\ge-8$$

$$4x+x-4x-4\ge-8$$

$$x-4\ge-8$$

$$x-4+4\ge-8+4$$

$$x\ge-4$$

Solution set: $[-4,\infty)$

Question 2: (5 points): (1.7 Exercise 39): Find the solution set of $x^2-x-6>0$.

Solution: $x^2-x-6>0 \Rightarrow (x-3)(x+2)>0$

The critical values of the inequality are -2 and 3.

x^2-x-6 + + + + + + | - - - -6 - - - - | + + + ++ + + ++ +

x $-\infty$ -2 0 3 ∞

Test: If $x=0$, then $0^2-0-6=-6$

Solution set $=(-\infty,-2]\cup[3,\infty)$

Question 3: (5 points): (1.7 Exercise 77): Find the solution set of $\frac{10}{3+2x}\le5$

Solution: $\frac{10}{3+2x}-5\le0 \quad\Rightarrow\quad \frac{10-15-10x}{3+2x}\le0 \quad\Rightarrow\quad \frac{-5-10x}{3+2x}\le0$

The values $-\frac{3}{2}$ and $-\frac{1}{2}$ divide the number line into three regions. Use an open circle on $-\frac{3}{2}$ because it makes the denominator equal 0.

Critical values: $-\frac{3}{2}$ $-\frac{1}{2}$

$-5-10x$	+	+	−
$3+2x$	−	+	+
$\frac{-5-10x}{3+2x}$	−	+	−
	-2	$-\frac{3}{2}$ -1	$-\frac{1}{2}$ 0

Solution set: $\left(-\infty,-\frac{3}{2}\right)\cup\left[-\frac{1}{2},\infty\right)$

Question 4: (5 points): (1.8 Exercise 71): Find the solution set of $|3x^2 + x| = 14$

Solution:

71. $|3x^2 + x| = 14 \Rightarrow 3x^2 + x = 14$ or $3x^2 + x = -14$

$$3x^2 + x = 14$$
$$3x^2 + x - 14 = 0$$
$$(3x+7)(x-2) = 0$$
$$3x + 7 = 0 \Rightarrow x = -\tfrac{7}{3}$$
$$x - 2 = 0 \Rightarrow x = 2$$
$$3x^2 + x = -14$$
$$3x^2 + x + 14 = 0$$

We must use the quadratic formula with $a = 3$, $b = 1$, and $c = 14$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 3 \cdot 14}}{2 \cdot 3} = \frac{-1 \pm \sqrt{-167}}{6}$$
$$= \frac{-1 \pm i\sqrt{167}}{6} = -\frac{1}{6} \pm \frac{i\sqrt{167}}{6}$$

Solution set: $\left\{-\tfrac{7}{3}, 2, -\tfrac{1}{6} \pm \tfrac{i\sqrt{167}}{6}\right\}$

Question 5: (5 points): (1.8 Exercises 30 and 31): If A is the solution set of $|3x - 4| \geq 2$ and B is the solution set of $\left|\frac{1}{2} - x\right| < 2$, then find $A \cap B = ?$

Solution:

30. $|3x - 4| \geq 2$

$3x - 4 \leq -2 \Rightarrow 3x \leq 2 \Rightarrow x \leq \frac{2}{3}$ or

$3x - 4 \geq 2 \Rightarrow 3x \geq 6 \Rightarrow x \geq 2$

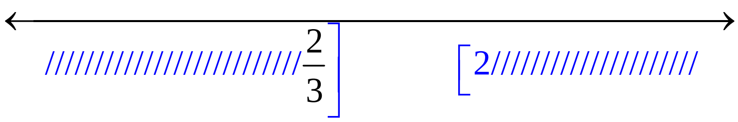
Solution set: $\left(-\infty, \frac{2}{3}\right] \cup [2, \infty)$

31. $\left|\frac{1}{2} - x\right| < 2$

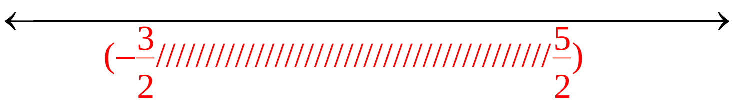
$$-2 < \tfrac{1}{2} - x < 2$$
$$2(-2) < 2\left(\tfrac{1}{2} - x\right) < 2(2)$$
$$-4 < 1 - 2x < 4$$
$$-5 < -2x < 3$$
$$\tfrac{5}{2} > x > -\tfrac{3}{2}$$

Solution set: $\left(-\frac{3}{2}, \frac{5}{2}\right)$

A:



B:



$$A \cap B = \left(-\frac{3}{2}, \frac{2}{3}\right] \cup \left[2, \frac{5}{2}\right)$$