

Solution Book of Mathematic

Senior 2 Part I

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14.1 Fractional Inequalities

Inequalities that involve fractional expressions are called fractional inequalities. To solve a fractional inequality, we manipulate the inequality until the right side is zero.

14.1.1 Practice 8

Solve the following inequalities:

1. $\frac{x-5}{3x+1} > 2$

Sol.

$$\frac{x-5}{3x+1} > 2$$

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

$$\frac{x-5-2(3x+1)}{3x+1} > 0$$

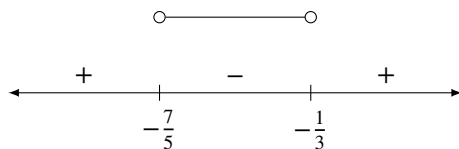
$$\frac{x-5-6x-2}{3x+1} > 0$$

$$\frac{-5x-7}{3x+1} > 0$$

$$-\frac{5x+7}{3x+1} > 0$$

$$\frac{5x+7}{3x+1} < 0$$

$$-\frac{7}{5} < x < -\frac{1}{3}$$



2. $\frac{x+22}{x-2} < x+1$

Sol.

$$\frac{x+22}{x-2} < x+1$$

$$\frac{x+22-(x-2)(x+1)}{x-2} < 0$$

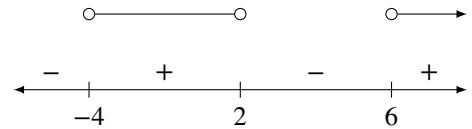
$$\frac{x+22-x^2+x+2}{x-2} < 0$$

$$\frac{-x^2+2x+24}{x-2} < 0$$

$$\frac{x^2-2x-24}{x-2} > 0$$

$$\frac{(x-6)(x+4)}{x-2} > 0$$

$$-4 < x < 2 \text{ or } x > 6$$



3. $\frac{1}{x-3} \geq \frac{1}{2x-1}$

Sol.

$$\frac{1}{x-3} \geq \frac{1}{2x-1}$$

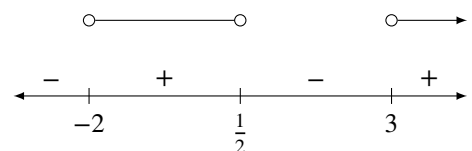
$$\frac{2x-1-x+3}{(x-3)(2x-1)} \geq 0$$

$$\frac{x+2}{(x-3)(2x-1)} \geq 0$$

When $\frac{x+2}{(x-3)(2x-1)} = 0$, $x = -2$

When $\frac{x+2}{(x-3)(2x-1)} > 0$, $-2 < x < \frac{1}{2}$ or $x > 3$

$$\therefore -2 \leq x < \frac{1}{2} \text{ or } x > 3$$



4. $\frac{x^2-7}{1-x^2} \leq 1$

Sol.

$$\frac{x^2-7}{1-x^2} \leq 1$$

$$\frac{x^2-7-1+x^2}{1-x^2} \leq 0$$

$$\frac{2x^2-8}{(1+x)(1-x)} \leq 0$$

$$\frac{2(x+2)(x-2)}{-(x+1)(x-1)} \leq 0$$

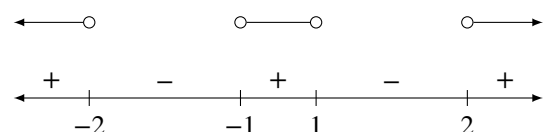
$$\frac{(x+2)(x-2)}{(x+1)(x-1)} \geq 0$$

When $\frac{(x+2)(x-2)}{(x+1)(x-1)} = 0$, $x = -2$ or $x = 2$

When $\frac{(x+2)(x-2)}{(x+1)(x-1)} > 0$,

$$x < -2 \text{ or } -1 < x < 1 \text{ or } x > 2$$

$$\therefore x \leq -2 \text{ or } -1 \leq x < 1 \text{ or } x \geq 2$$



14.1.2 Exercise 15.5

Solve the following inequalities:

1. $\frac{7-x}{9-x} > \frac{1}{2}$

2. $\frac{5-x}{2} \geq \frac{3-x}{x}$

3. $\frac{x-4}{x+6} > \frac{1}{x}$

4. $\frac{1}{x-3} \geq \frac{1}{2x+2}$

5. $\frac{x-1}{x+1} - \frac{1}{x-1} \leq 1$

6. $1 + \frac{1}{x-2} \leq \frac{x-2}{x-1}$

7. $\frac{x^2+x-6}{x^2+4x+4} \leq 0$

8. $\frac{2x^2-3x+1}{x^2+5x+6} \geq 0$