

Name: Key

Date: _____

Solving Rational Inequalities

Situation #1: In terms of zero, no factoring

Example: $\frac{x+1}{x-5} \leq 0$

Open circle!!!

What value makes the numerator zero? What value makes the denominator zero?

$x+1=0$
 $x=-1$

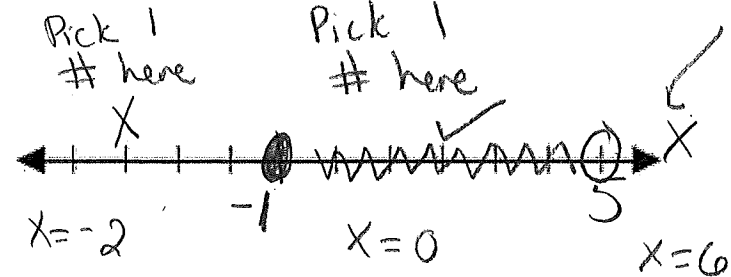
$x-5 \neq 0$
 $x \neq 5$

$x = -2 \rightarrow \frac{-2+1}{-2-5} \leq 0$ X

$x = 0 \rightarrow \frac{0+1}{0-5} \leq 0$ ✓

Pick 1 # here $x = 6 \rightarrow \frac{6+1}{6-5} \leq 0$ X

Check values on number line:



Write answer in interval notation (be careful with parentheses vs. brackets!)

$[-1, 5)$

Situation #2: In terms of zero, needs factoring

Example: $\frac{x^2+4x+3}{x-1} > 0$ ← open circle!

Factor: $\frac{(x+3)(x+1)}{(x-1)} > 0$

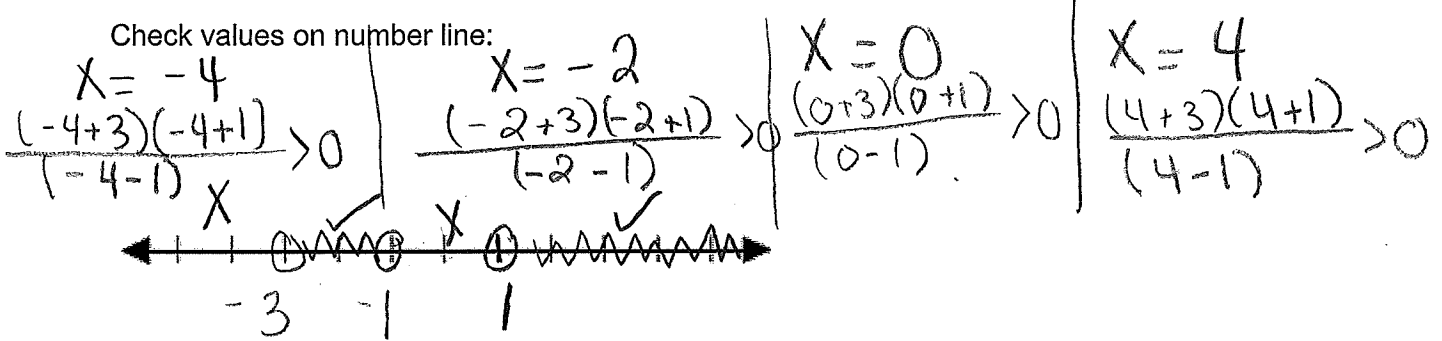
What values result in numerator / denominator being equal to zero?

Num: $(x+3)(x+1) = 0$ $(x-1) \neq 0$
 $x = -3$ $x = -1$ $x \neq 1$

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

$$x = -3, -1 \quad x \neq 1$$

Check values on number line:



Interval Notation Answer:

$$(-3, -1) \cup (1, \infty)$$

Situation #3: Not in terms of zero

If the inequality is not in terms of zero, you need to set it equal to zero & simplify the rational function as needed

Example: $\frac{3x+1}{x+4} > 1$

$$\frac{3x+1}{x+4} - 1 > 0 \Rightarrow \frac{3x+1}{x+4} - \frac{x+4}{x+4} > 0$$

$$\Rightarrow \frac{3x+1 - (x+4)}{x+4} > 0$$

Set equal to zero and simplify

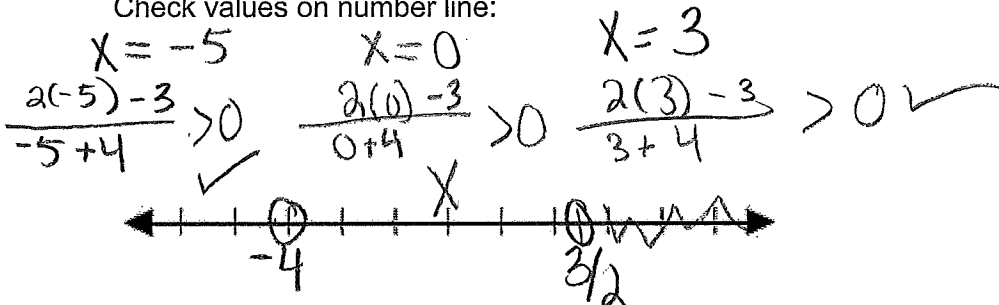
$$\frac{2x-3}{x+4} > 0$$

$$\Rightarrow \frac{3x+1 - x - 4}{x+4} > 0 \Rightarrow \frac{2x-3}{x+4}$$

What values result in numerator / denominator being equal to zero?

Num: $2x-3=0 \quad x+4 \neq 0$
 $x \neq 3/2 \quad x \neq -4$

Check values on number line:



Interval Notation Answer:

$$(-\infty, -4) \cup (3/2, +\infty)$$