Solving Rational Inequalities

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A rational inequality is an inequality which contains a rational expression. When solving these rational inequalities, there are steps that lead us to the solution.

*What does "critical value" mean?

To solve Rational Inequalities:

(1) Write the inequality as an , and solve the .

(2) Determine any values that make the denominator equal

(3) On a , mark each of the values from steps 1 and 2. These values will create intervals on the number line.

(4) Select a test point in each , and check to see if that test point the inequality. (Find the intervals which satisfy the inequality).

(5) Mark the number line to reflect the values and intervals that the inequality.

(6) State your answer using the desired form of notation.

*What does "satisfy" mean in math?

Example 1: Solve $\dfrac{x-4}{x+5} < 4$

$$\frac{x-4}{x+5} = 4$$

Create an equation. Change < to =, and solve. Notice that if $x = -5$, the denominator is 0.

$$\frac{x-4}{} = 4$$

$$1$$

Multiply both sides by to eliminate the fraction.

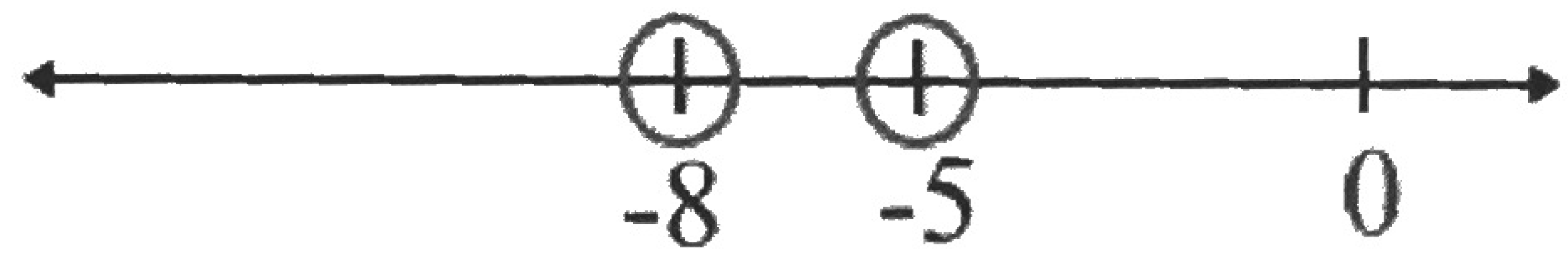
In a proportion the product of the means equals the product of the extremes.

Critical values are $x = -8$ and

$x = -5$ ← why is negative 5 a critical value?

On the number line, plot -5 and -8. Since -5 cannot be used, it is an open circle.

The inequality is strictly "less than", so the -8 is also an open circle.



Test a point in each of the three intervals formed: *place the points -9, -6, and 0 on your numberline.

test point -9	test point -6	test point 0
$\frac{-4}{+5} < 4$	$\frac{-4}{+5} < 4$	$\frac{-4}{+5} < 4$

Stated as an inequality, the solution is:

x or x

Stated in interval notation, the solution is:

$(\quad) \cup (\quad)$

When the numerator of the inequality is a , combine the Quadratic Inequality method of solution with this Rational Inequality method. Check out this example.

Example 2: Solve $\frac{x^2 - 2x - 15}{x - 2} \geq 0$

$$\frac{x^2 - 2x - 15}{x - 2} \geq 0$$

the numerator, form an equation, and solve this quadratic equation.

Factor, and find the solutions or critical values for the numerator.

Also keep in mind that the

$x^2 - 2x - 15 = 0$

$(\quad)(\quad) = 0$

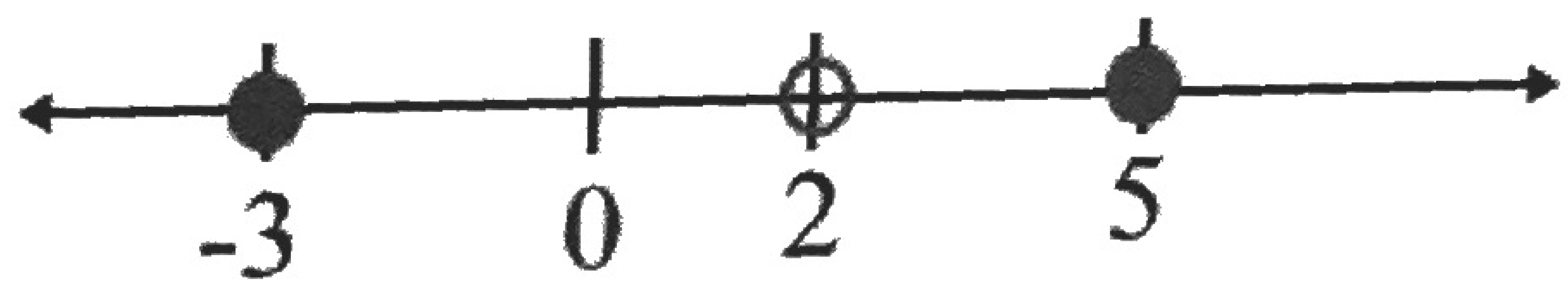
or

denominator has $x = 2$ as a value as well. *Why is 2 an important value

Since $x = 2$ creates an d, it is drawn as an circle on the number line.

Place the critical values on a number line. Since the inequality is *greater than or equal to*, the $x =$ or $x =$ are drawn on the number line as a circle, which means to them as part of the answer. Test the intervals that are formed.

*Why is 3 and 5 Colorded in?



*Why is 2 an open circle?

test $x = -4$	*test* $x = 0$	*test* $x = 3$	*test* $x = 6$
$\dfrac{(\;)^2 - 3(\;) - 15}{(\;) - 2} \geq 0$	$\dfrac{(\;)^2 - 3(\;) - 15}{(\;) - 2} \geq 0$	$\dfrac{(\;)^2 - 3(\;) - 15}{(\;) - 2} \geq 0$	$\dfrac{(\;)^2 - 3(\;) - 15}{(\;) - 2} \geq 0$

The solution is:

x or x

In interval notation, the solution is:

$[\quad) \cup [\quad)$