

Warm-up!

Solve the following inequalities:

1) $2x$

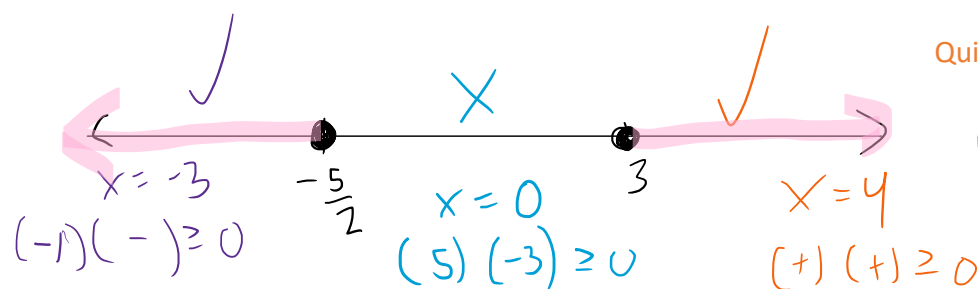
$$2x^2 - x - 15 \geq 0$$

$$(2x + 5)(x - 3) \geq 0$$

Unit 1 Day 10 (1.8):
Rational Inequalities

Homework: Rational
Inequalities

Quiz Next Class



$$(-\infty, -\frac{5}{2}] \cup [3, \infty)$$

1. Combine using a common denominator.

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

$$\frac{2x-6}{(x-3)(x)} - \frac{x}{(x-3)(x)}$$

$$\frac{x-6}{(x-3)(x)}$$

1. At what x -value(s) is the expression from #2 equal to zero?

$$x = 6$$

1. At what x -value(s) is the expression from #2 undefined?

$$x = 0 \text{ and } x = 3$$

A closer look at bouncing vs crossing rules

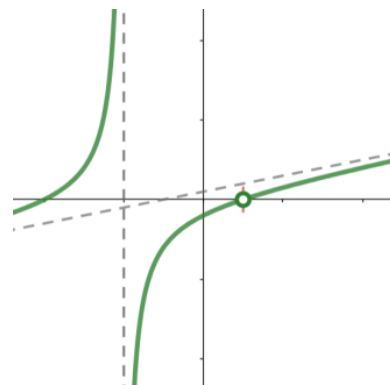
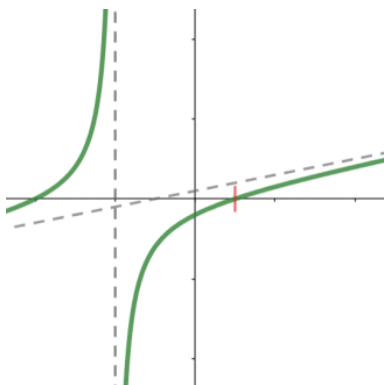
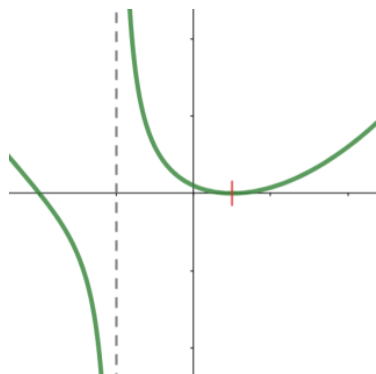
Predict what will happen at $x = 1$

$$\frac{(x+4)(x-1)}{x+2} \quad \text{Hole! } (1, 0)$$

$$y = \frac{(x+4)(x-1)^2}{(x+2)}$$

$$y = \frac{(x+4)(x-1)}{(x+2)}$$

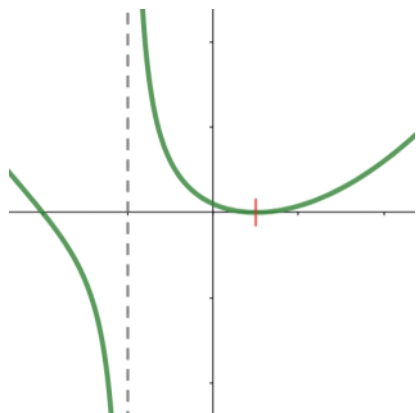
$$y = \frac{(x+4)(x-1)^2}{(x+2)(x-1)}$$



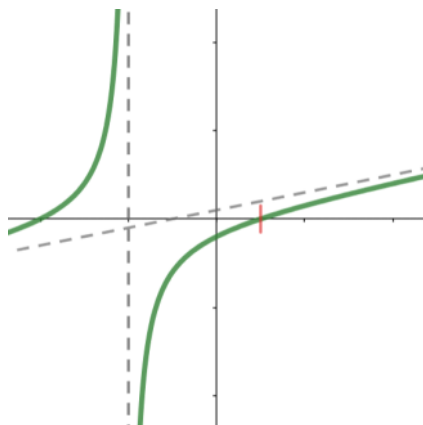
A closer look at bouncing vs crossing rules

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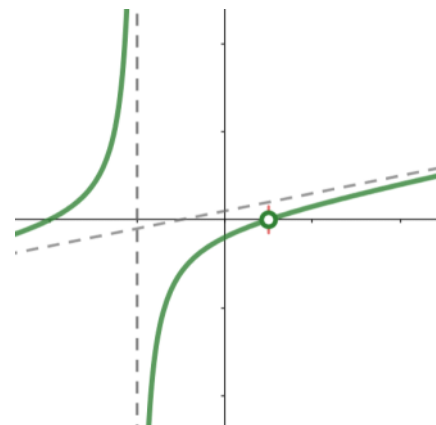
$$y = \frac{(x + 4)(x - 1)^2}{(x + 2)}$$



$$y = \frac{(x + 4)(x - 1)}{(x + 2)}$$



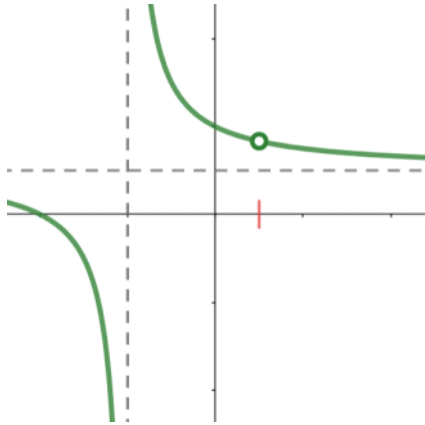
$$y = \frac{(x + 4)(x - 1)^2}{(x + 2)(x - 1)}$$



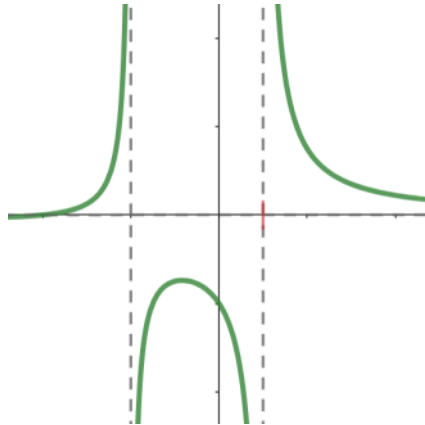
A closer look at bouncing vs crossing rules

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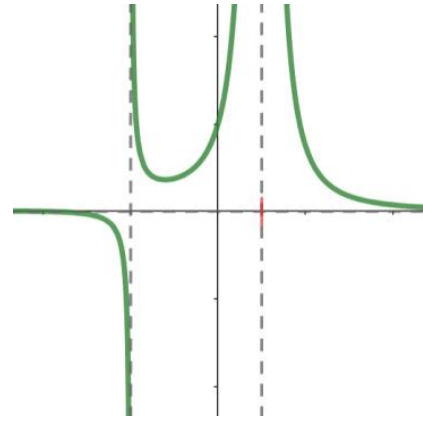
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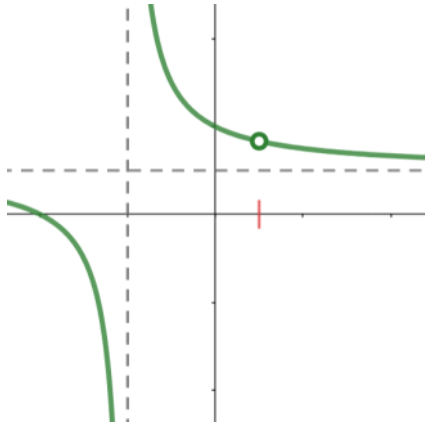
$$y = \frac{(x + 4)}{(x + 2)(x - 1)^2}$$



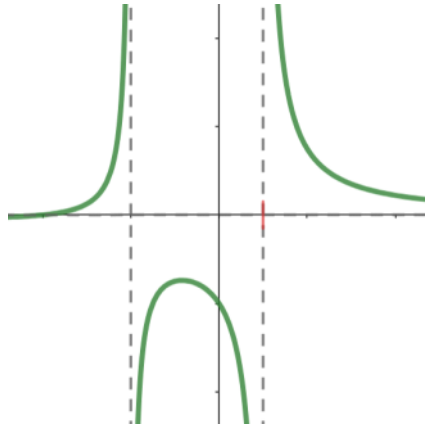
A closer look at bouncing vs crossing rules

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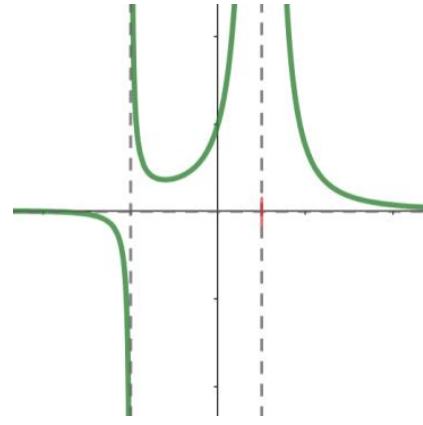
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A closer look at bouncing vs crossing rules

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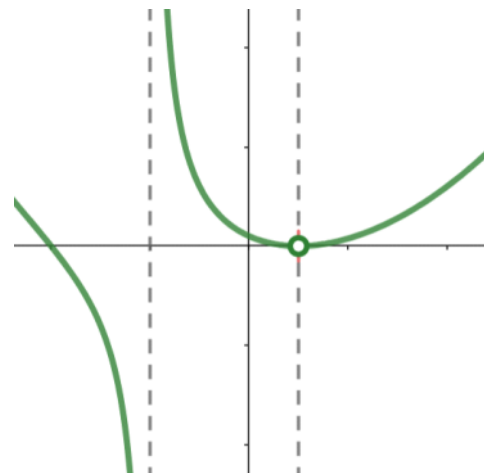
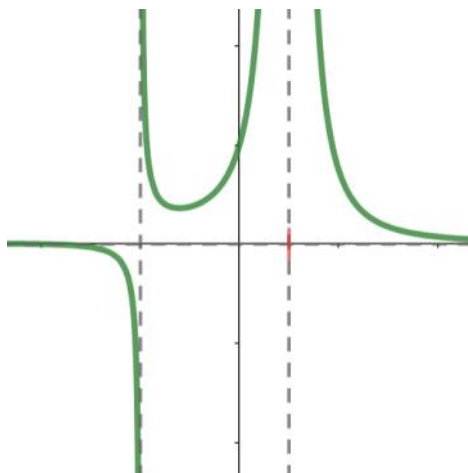
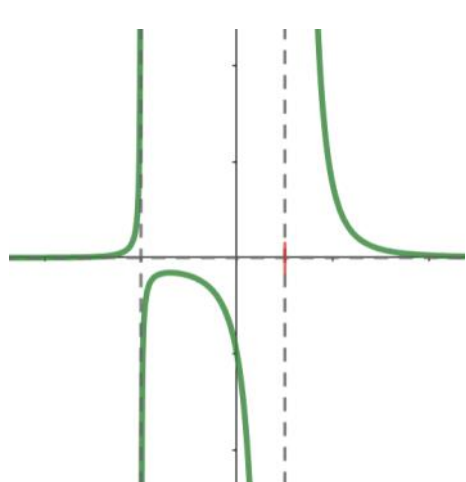
$$\frac{(x+4)}{(x+2)(x-1)^2}$$

$$\frac{(x+4)(x-1)^2}{x+2}$$

$$y = \frac{(x+4)}{(x+2)(x-1)^3}$$

$$y = \frac{(x+4)(x-1)}{(x+2)(x-1)^2}$$

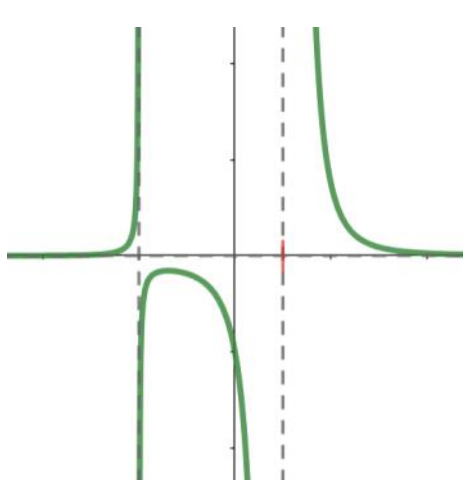
$$y = \frac{(x+4)(x-1)^3}{(x+2)(x-1)}$$



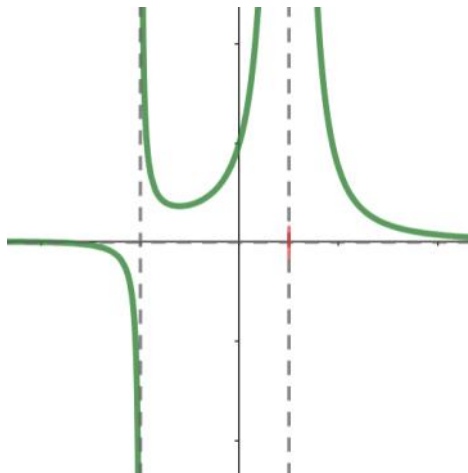
A closer look at bouncing vs crossing rules

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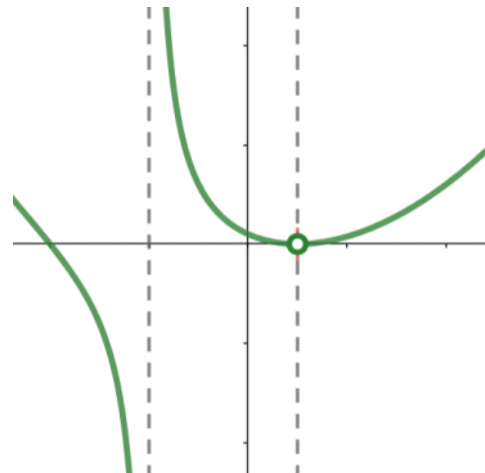
$$y = \frac{(x + 4)}{(x + 2)(x - 1)^3}$$



$$y = \frac{(x + 4)(x - 1)}{(x + 2)(x - 1)^3}$$



$$y = \frac{(x + 4)(x - 1)^3}{(x + 2)(x - 1)}$$



To Solve Rational Inequalities

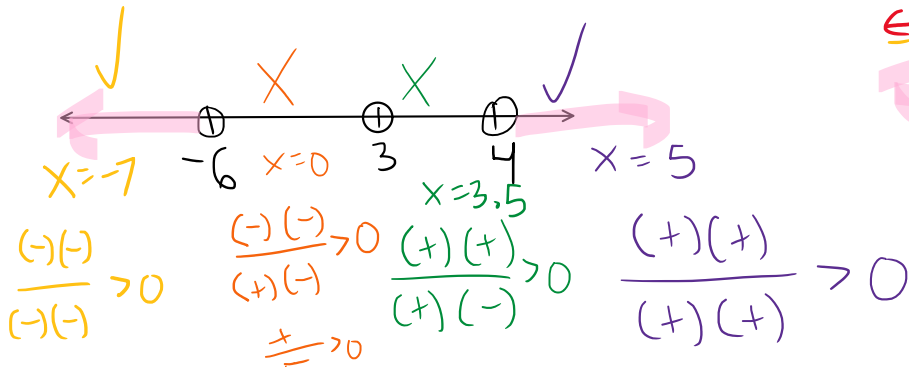
1. Move everything to one side, combine into a single rational expression
2. Put zeros of numerator and zeros of denominator on number line
3. Test regions/Apply understanding of bouncing + crossing + rational end behavior
4. Check answer

$$\frac{x^2 - 6x + 9}{x^2 + 2x - 24} > 0$$

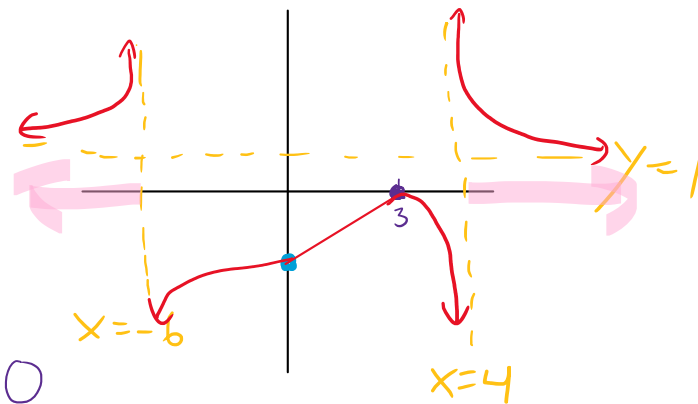
$$\frac{(x-3)(x-3)}{(x+6)(x-4)} > 0$$

Solving By Testing Regions

$$(-\infty, -6) \cup (4, \infty)$$



Solving By Graphing

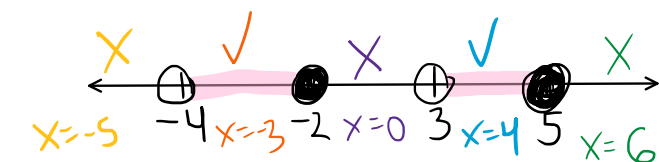


Example 1

$$\frac{(x+2)(x-5)}{(x-3)(x+4)} \leq 0$$

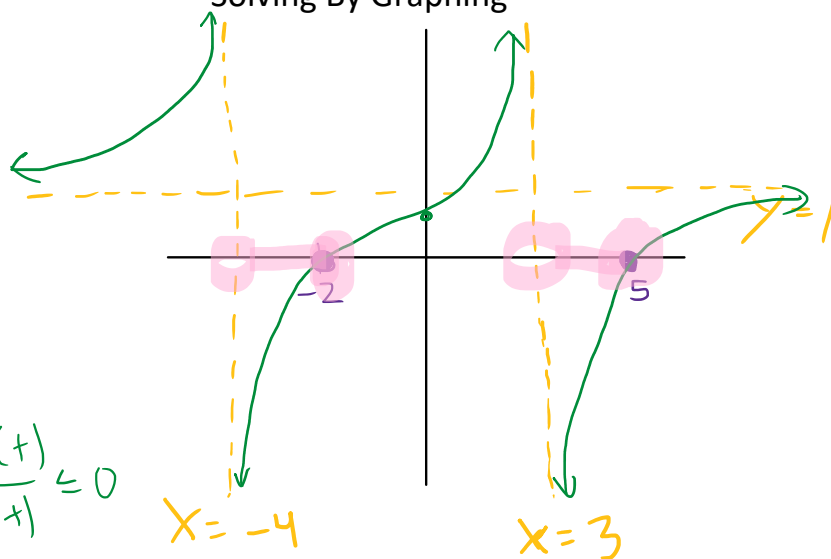
Solving By Testing Regions

$$[-4, -2] \cup [3, 5]$$



$$\frac{(-)(-)}{(-)(-)} \leq 0 \quad \frac{(-)(-)}{(-)(+)} \leq 0 \quad \frac{(+)(-)}{(+)(+)} \leq 0 \quad \frac{(+)(-)}{(-)(+)} \leq 0 \quad \frac{(+)(+)}{(+)(+)} \leq 0$$

Solving By Graphing



Example 2

$$\frac{-7}{-5} = \frac{7}{5}$$

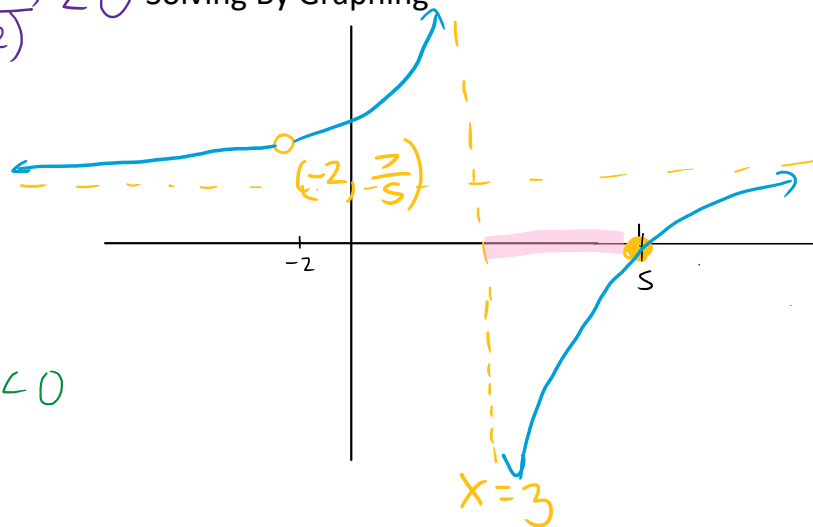
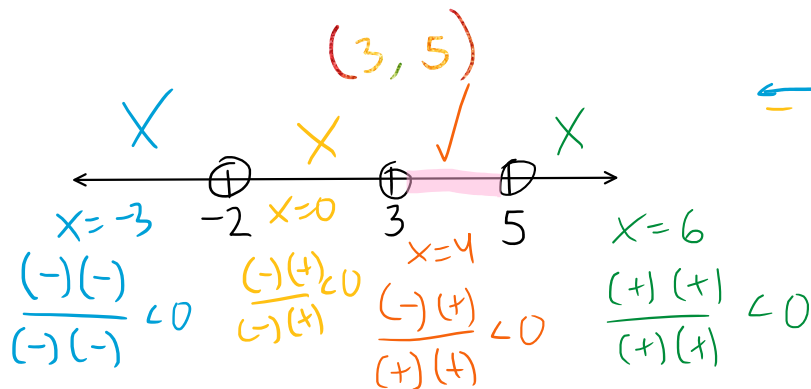
$$\frac{x^2 - 3x - 10}{x^2 - x - 6} < 0$$

$$\frac{(x-5)}{(x-3)} < 0$$

Solving By Testing Regions

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

Solving By Graphing



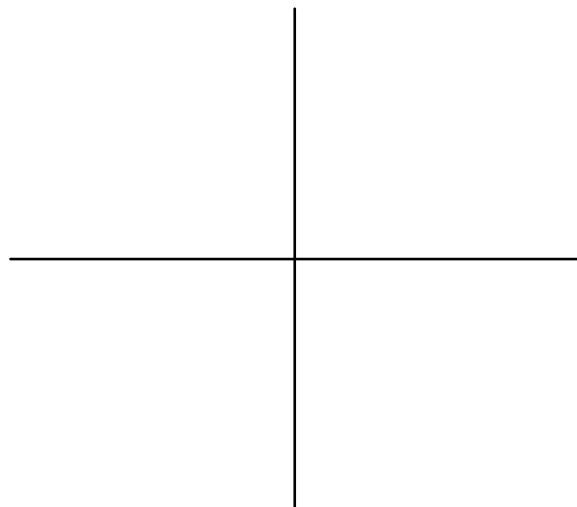
Example 3

$$\frac{(x - 6)^2(x + 4)(x - 1)^3}{(x + 2)^2(x - 5)} < 0$$

Solving By Testing Regions



Solving By Graphing



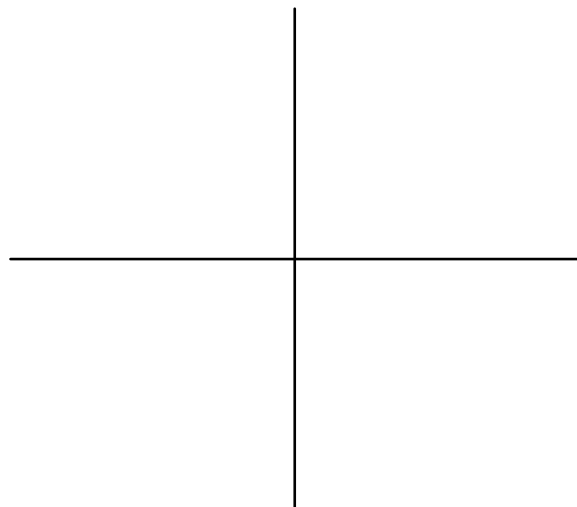
Example 4

$$\frac{2x^3 - 5x^2}{4x^2 - 20x + 25} \geq 0$$

Solving By Testing Regions



Solving By Graphing



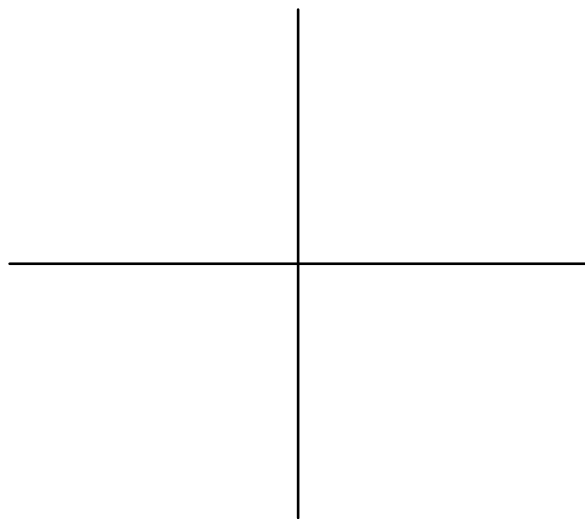
Example 5 (from the warm-up)

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

Solving By Testing Regions



Solving By Graphing



v2025 Quiz Polynomials and Rates of Change



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