

Rational Inequalities

Standard 4f: Use sign patterns to solve rational inequalities

We've found a number of traits already in Standards 4a, 4b, 4d, and 4e

Now we are going to use inequalities to determine values of y

- **Solving a Rational Inequality**

1. Determine when $y = 0$ or undefined
2. Make a sign pattern to determine the values of x for which y is positive, negative, zero, or undefined
3. Write the interval to include the zeros only if they were included in the original inequality (in other words, if the original inequality used ≥ 0 or ≤ 0)

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

Numerator = 0

$$x + 2 = 0$$

Find the values of x for which

$$f(x) < 0$$

$$x = -2$$

So we start by finding the values of x for which

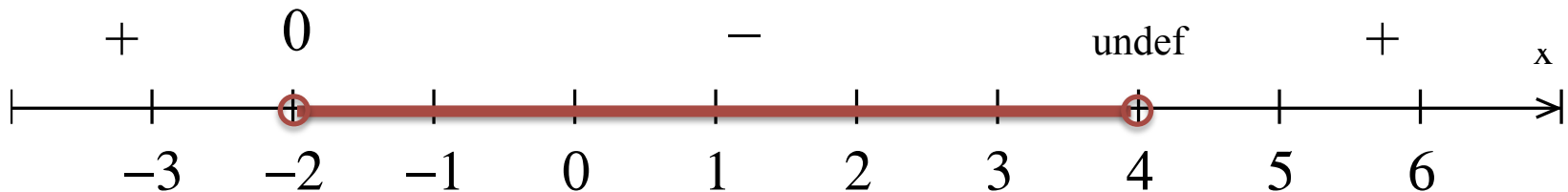
$$\frac{x+2}{x-4} = 0 \text{ or undefined}$$

Denominator = 0

$$x - 4 = 0$$

$$x = 4$$

Numerator = 0 or Denominator = 0



$$-2 < x < 4 \quad \text{or} \quad x \in (-2, 4)$$

Find the values of x for which

$$\frac{x^2 + 6x}{x - 2} \geq 0$$

$$\frac{x^2 + 6x}{x - 2} = 0$$

$$\frac{x(x + 6)}{x - 2} = 0 \text{ or undefined}$$

Numerator = 0 or Denominator = 0

Numerator = 0

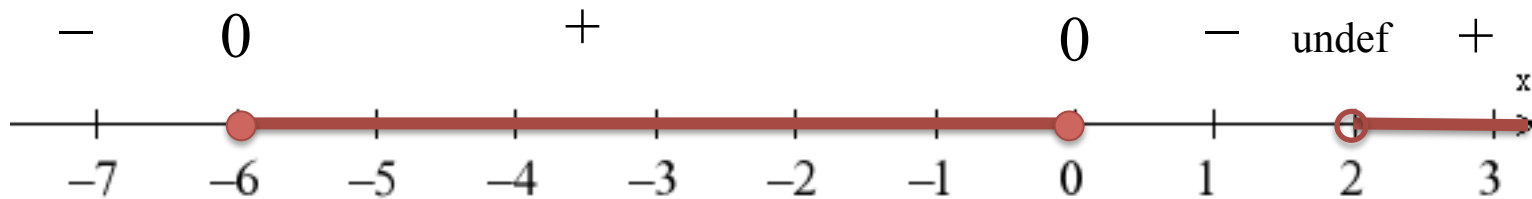
$$x(x + 6) = 0$$

$$x = -6, 0$$

Denominator = 0

$$(x - 2) = 0$$

$$x = 2$$



$$-6 \leq x \leq 0 \text{ or } x > 2$$

$$x \in [-6, 0] \cup (2, \infty)$$