
Inequations (Mathematics)

Inequations

For inequations, the = sign is replaced by greater than (>) or less than (<) signs.

When multiplying or dividing both sides of the inequality by a **negative** number, you must reverse the direction of the inequality sign.

Axioms of inequalities

If $a > b$ then:

$$\begin{aligned} a + c &> b + c \\ a - c &> b - c \\ ac &> bc \text{ if } c > 0 \\ ac &< bc \text{ if } c < 0 \text{ (note the sign reversal)} \\ \frac{a}{c} &> \frac{b}{c} \text{ if } c > 0 \\ \frac{a}{c} &< \frac{b}{c} \text{ if } c < 0 \text{ (note the sign reversal)} \end{aligned}$$

Square roots and absolute values

Note that $\sqrt{x^2} = |x|$

$$\begin{aligned} \sqrt{x^2} &= |x| = x \text{ if } x > 0 \\ &= -x \text{ if } x < 0 \\ &= 0 \text{ if } x = 0 \\ |xy| &= |x| \cdot |y| \\ |x + y| &\leq |x| \cdot |y| \text{ and } |x + y| = |x| \cdot |y| \\ &\text{if and only if } x \text{ and } y \text{ are either both zero or both have the same sign.} \end{aligned}$$