Solving Quadratic Inequalities in Algebra

$ax^2 + bx + c > 0 \ (a > 0, \ b, c \in \mathbb{R})$

▸ Start

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Let $D = b^2 - 4ac$

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- $D > 0$: Let α and β be roots of $ax^2 + bx + c = 0$

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Let $D = b^2 - 4ac$

- $D > 0$: Let α and β be roots of $ax^2 + bx + c = 0$ where $\alpha < \beta$.

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  $\therefore$

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Let α and β be roots of $ax^2 + bx + c = 0$

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$$(x - \alpha)(x - \beta) > 0$$

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\left(x + \frac{b}{2a}\right)^2 - \frac{b^2}{4a^2} + \frac{c}{a} &> 0
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$$\therefore\ x \neq -\frac{b}{2a}$$

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\left(x + \frac{b}{2a}\right)^2 - \frac{b^2}{4a^2} + \frac{c}{a} &> 0 \\
\left(x + \frac{b}{2a}\right)^2 - \frac{b^2 - 4ac}{4a^2} &> 0
\end{aligned}
$$

$$\therefore \ \mathbb{R}$$

Solving Quadratic Inequalities in Algebra

$ax^2 + bx + c > 0 \ (a > 0,\ b, c \in \mathbb{R})$

▸ First

$$
\begin{aligned}
ax^2 + bx + c &> 0 \quad (a > 0,\ b, c \in \mathbb{R}) \\
x^2 + \frac{b}{a}x + \frac{c}{a} &> 0 \quad (\because a > 0) \\
\left(x + \frac{b}{2a}\right)^2 - \frac{b^2}{4a^2} + \frac{c}{a} &> 0 \\
\left(x + \frac{b}{2a}\right)^2 - \frac{b^2 - 4ac}{4a^2} &> 0
\end{aligned}
$$

$$\therefore\ \mathbb{R} \ (\because b^2 - 4ac < 0)$$