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

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

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

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Let $D = b^2 - 4ac$

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

Let $D = b^2 - 4ac$

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

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Let $D = b^2 - 4ac$

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Let $D = b^2 - 4ac$

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

  proof

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  $\therefore\ x \leq \alpha$

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- $D \leq 0$

Start End

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Let $D = b^2 - 4ac$

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  $\therefore\ \mathbb{R}$ proof

$$ax^2 + bx + c \geq 0$$

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

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

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

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

$$x^2 + \frac{b}{a}x + \frac{c}{a} \geq 0 \quad (\because a > 0)$$

Let α and β be roots of $ax^2 + bx + c = 0$ where $\alpha < \beta$.
$(\because b^2 - 4ac > 0)$

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

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i) $x - \alpha \geq 0, x - \beta \geq 0$

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

i) $x - \alpha \geq 0, x - \beta \geq 0 \Rightarrow x \geq \beta$

ii) $x - \alpha \leq 0, x - \beta \leq 0$

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

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Home Start End

$$ax^2 + bx + c \quad \geq \quad 0$$

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

Home Start End

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$$

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

Github:
https://min7014.github.io/math20210510001.html

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