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

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

Start End

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

Start End

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

Let $D = b^2 - 4ac$

▸ Start ▸ End

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

Let $D = b^2 - 4ac$

- $D > 0$

Start End

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

Let $D = b^2 - 4ac$

- $D > 0$:

▸ Start ▸ End

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

Let $D = b^2 - 4ac$

- $D > 0$: Let

Start End

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

Let $D = b^2 - 4ac$

- $D > 0$: Let α

Start End

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

Let $D = b^2 - 4ac$

- $D > 0$: Let α and

▸ Start ▸ End

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

Let $D = b^2 - 4ac$

- $D > 0$: Let α and β

▸ Start ▸ End

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

Let $D = b^2 - 4ac$

- $D > 0$: Let α and β be roots

Start End

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

Let $D = b^2 - 4ac$

- $D > 0$: Let α and β be roots of

▸ Start ▸ End

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

Let $D = b^2 - 4ac$

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

Start End

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

Let $D = b^2 - 4ac$

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

Start End

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

Let $D = b^2 - 4ac$

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

Start End

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

Let $D = b^2 - 4ac$

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

Start End

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

Let $D = b^2 - 4ac$

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

Start End

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

Let $D = b^2 - 4ac$

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

  $\therefore\ x < \alpha\ or$

▸ Start ▸ End

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

Let $D = b^2 - 4ac$

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

Start End

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

Let $D = b^2 - 4ac$

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

Start End

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

Let $D = b^2 - 4ac$

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

Start End

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

Let $D = b^2 - 4ac$

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

  $\therefore\ x < \alpha$ or $x > \beta$ proof

- $D = 0$

  $\therefore\ x$

Start End

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

Let $D = b^2 - 4ac$

- $D > 0$: Let α and β be roots of $ax^2 + bx + c = 0$ where $\alpha < \beta$.
  $\therefore\ \ x < \alpha$ or $x > \beta$ proof
- $D = 0$
  $\therefore\ \ x \neq -\dfrac{b}{2a}$

Start End

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

Let $D = b^2 - 4ac$

- $D > 0$: Let α and β be roots of $ax^2 + bx + c = 0$ where $\alpha < \beta$.
  $\therefore\ x < \alpha$ or $x > \beta$ proof
- $D = 0$
  $\therefore\ x \neq -\dfrac{b}{2a}$ proof
- $D < 0$

Start End

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

Let $D = b^2 - 4ac$

- $D > 0$: Let α and β be roots of $ax^2 + bx + c = 0$ where $\alpha < \beta$.
  $\therefore\ \ x < \alpha$ or $x > \beta$ proof
- $D = 0$
  $\therefore\ \ x \neq -\dfrac{b}{2a}$ proof
- $D < 0$
  $\therefore$

Start End

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

Let $D = b^2 - 4ac$

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

  $\therefore\ x < \alpha$ or $x > \beta$ proof
- $D = 0$

  $\therefore\ x \neq -\dfrac{b}{2a}$ proof
- $D < 0$

  $\therefore\ \mathbb{R}$ proof

Home Start End

Home Start End

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

Home Start End

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

Home Start End

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

Home Start End

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

Let

Home Start End

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

Let α and β

Home Start End

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

Let α and β be roots

Home Start End

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

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

Home Start End

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

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

Home Start End

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

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

Home Start End

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

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

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

Home Start End

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

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

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

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

Home Start End

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

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

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

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

Home Start End

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

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

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

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

Home Start End

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

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

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

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

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

Home Start End

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

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

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

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

ii) $x - \alpha < 0, x - \beta < 0 \Rightarrow$

Home Start End

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

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

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

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

ii) $x - \alpha < 0, x - \beta < 0 \Rightarrow x < \alpha$

▸ Home ▸ Start ▸ End

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

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

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

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

ii) $x - \alpha < 0, x - \beta < 0 \Rightarrow x < \alpha$

by i), ii)

Home Start End

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

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

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

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

ii) $x - \alpha < 0, x - \beta < 0 \Rightarrow x < \alpha$

by i), ii) $\therefore$

Home Start End

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

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

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

$$\begin{aligned} \text{i)}\ & x - \alpha > 0, x - \beta > 0 \Rightarrow x > \beta \\ \text{ii)}\ & x - \alpha < 0, x - \beta < 0 \Rightarrow x < \alpha \\ & \text{by i), ii)} \therefore\ x < \alpha \end{aligned}$$

Home Start End

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

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

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

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

ii) $x - \alpha < 0, x - \beta < 0 \Rightarrow x < \alpha$

by i), ii) $\therefore\ x < \alpha$ *or*

Home Start End

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

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

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

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

ii) $x - \alpha < 0, x - \beta < 0 \Rightarrow x < \alpha$

by i), ii) $\therefore\ x < \alpha$ *or* $x > \beta$

Home Start End

Home Start End

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

Home Start End

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

Home Start End

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

Home Start End

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

Home Start End

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

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

Home Start End

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

$$\therefore\ x\neq -\frac{b}{2a}$$

Home Start End

Home Start End

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

Home Start End

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

Home Start End

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

Home Start End

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

Home Start End

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

Home Start End

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

$$\therefore \mathbb{R}$$

Home Start End

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

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

Github:
https://min7014.github.io/math20210502002.html

Click or paste URL into the URL search bar, and you can see a picture moving.