

Polynomial Inequalities Sign-Chart Cheat Sheet

Quick reference for factoring, zeros, multiplicity, signs, and interval notation

1. Move to one side Rewrite so the other side is 0.	2. Factor completely Find all factors and repeated roots.	3. Mark the zeros Zeros split the number line into intervals.	4. Find each sign Test one value or reason from factor signs.	5. Choose intervals Keep only intervals satisfying the inequality.
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Multiplicity: does the sign change? Odd multiplicity: the graph crosses the x-axis, so the sign changes. Even multiplicity: the graph touches the x-axis and turns, so the sign stays the same. Example: in $(x - 2)^2(x + 3)$, $x = 2$ has even multiplicity.	Endpoint and interval notation rules $>$ or $<$ $\rightarrow$ exclude zeros $\rightarrow$ parentheses $\geq$ or $\leq$ $\rightarrow$ include zeros that satisfy equality $\rightarrow$ brackets ∞ and $-\infty$ always use parentheses.
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Worked sign-chart example

Solve: $(x + 3)(x - 1)(x - 4) \geq 0$ Zeros: -3, 1, 4

Interval	$(-\infty, -3)$	$(-3, 1)$	$(1, 4)$	$(4, \infty)$
Sign	Negative	Positive	Negative	Positive
Use for ≥ 0 ?	No	Yes	No	Yes

Answer: $[-3, 1] \cup [4, \infty)$. Each zero has odd multiplicity, so the sign changes at every zero.

Fast sign patterns to remember Two simple zeros, positive leading coefficient: positive outside, negative between. Odd-degree polynomial with simple ordered zeros: signs alternate as you pass each zero. Repeated even zero: do not flip the sign at that zero.	Final check before submitting Did you factor completely? Did you include every zero? Did you account for multiplicity? Did you use brackets only when equality is allowed? Did you keep parentheses beside infinity? Did you give the answer in interval notation rather than only listing test points?
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Repeated-root mini example

Solve: $(x + 1)^2(x - 4) < 0$ Zeros: -1 (even multiplicity), 4 (odd multiplicity)

$(-\infty, -1)$ Negative $\rightarrow$ use	$x = -1$ Zero $\rightarrow$ exclude	$(-1, 4)$ Negative $\rightarrow$ use	$x = 4$ Zero $\rightarrow$ exclude	$(4, \infty)$ Positive $\rightarrow$ do not use
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Answer: $(-\infty, -1) \cup (-1, 4)$. The sign does not flip at $x = -1$ because the factor is squared.

Interval-notation snapshots

$x < -2$ or $x > 5$ $(-\infty, -2) \cup (5, \infty)$	$-1 \leq x \leq 4$ $[-1, 4]$	$x = -2$ or $1 \leq x \leq 4$ $\{-2\} \cup [1, 4]$
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Use with the full Polynomial Inequalities Worksheet: sign-chart practice, factor-first inequalities, higher-degree problems, graph interpretation, and answer key.
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