

## RATIONAL INEQUALITIES

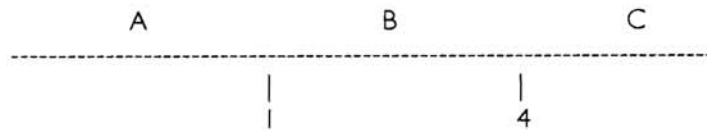
1. Find the number(s) that make any denominator in the inequality have a value of zero. These numbers are "free boundary numbers."
2. Replace the inequality symbol with an equal sign and solve the resulting equation to find other boundary numbers.
3. Draw a number line and label all boundary numbers and regions created.
4. See which regions are TRUE by checking a number in each region. To do this insert each test number into the original inequality.
5. Write the solution set.

Example 1:  $\frac{2X - 5}{X - 4} \leq 1$                       Free Boundary number:  $X - 4 = 0$   
 $X = 4$

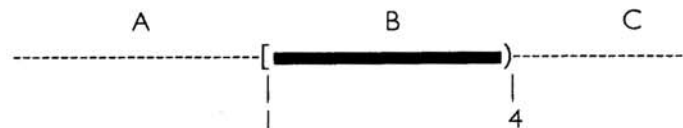
$$\frac{2X - 5}{X - 4} = 1$$

$$\frac{\cancel{X-4}2X - 5}{\cancel{X-4}} = 1(X-4)$$

$$\begin{array}{r} 2X - 5 = X - 4 \\ -X + 5 \quad -X + 5 \\ \hline X = 1 \end{array}$$



Region	Test Number	Results	Truth of Results
A	0	$5/4 \leq 1$	False
B	2	$1/2 \leq 1$	TRUE
C	5	$5/1 \leq 1$	False



Solution Set: Set builder notation  $\{X \mid 1 \leq X < 4\}$   
 Interval notation  $[1, 4)$

Note: 1 is part of the solution set, but 4 is not since the denominator of the rational expression is zero when  $X=4$

Example 2:

$$\frac{3}{X+1} > \frac{2}{X-1}$$

Free Boundary numbers:

$$\begin{aligned} X+1 &= 0 & X-1 &= 0 \\ X &= -1 & X &= 1 \end{aligned}$$

$$\frac{3}{X+1} = \frac{2}{X-1}$$

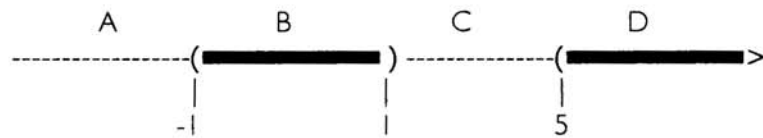
$$\frac{3(X-1)}{(X+1)(X-1)} = \frac{2(X+1)}{(X+1)(X-1)}$$

$$\begin{aligned} 3X - 3 &= 2X + 2 \\ -2X + 3 &= -2X + 3 \end{aligned}$$

$$\underline{X = 5}$$



Region	Test Number	Results	Truth of Results
A	-2	$-3/1 > -2/3$	False
B	0	$3/1 > -2/1$	TRUE
C	2	$1 > 2/1$	False
D	6	$3/7 > 2/5$	TRUE



Solution Set: Set builder notation  $\{x \mid -1 < X < 1 \text{ or } X > 5\}$   
 Interval notation  $(-1, 1) \cup (5, \infty)$