

Inequalities – Rational

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Your Personal Mathematics Trainer
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Question 01: Solve for x: $\frac{2x-3}{x+4} \leq 5$

Solution:

Step	Inequality	Reason
0	$\frac{2x-3}{x+4} \leq 5$	
1	$\frac{2x-3}{x+4} - 5 \leq 0$	
2	$\frac{2x-3}{x+4} - \frac{5(x+4)}{(x+4)} \leq 0$	
3	$\frac{(2x-3) - 5(x+4)}{x+4} \leq 0$	
4	$\frac{-3x-23}{x+4} \leq 0$ OR $-\frac{3x+23}{x+4} \leq 0$ OR $\frac{3x+23}{x+4} \geq 0$	
5	Determine Boundary Points: 1. $\frac{3x+23}{x+4} = 0$ $3x+23 = 0$ $x = -\frac{23}{3}$ 2. $\frac{3x+23}{x+4} = \text{Undefined}$ $x+4 = 0$ $x = -4$	

6	<p>Check Boundary Points:</p> <p>1. $x = -\frac{23}{3}$: $\frac{2\left[-\frac{23}{3}\right]-3}{\left[-\frac{23}{3}\right]+4} \stackrel{?}{\leq} 5$</p> $\frac{2\left[-\frac{23}{3}\right]-3}{\left[-\frac{23}{3}\right]+4} \stackrel{?}{\leq} 5$ $\frac{-46-9}{-23+12} \stackrel{?}{\leq} 5$ $\frac{-55}{-11} \stackrel{?}{\leq} 5$ $5 \stackrel{?}{\leq} 5 \text{ True}$ <p>2. $x = -4$: $\frac{2[-4]-3}{[-4]+4} \stackrel{?}{\leq} 5$</p> <p>Division by Zero: False</p>	
7	<p>Check Intervals:</p> <p>1. $\left(-\infty, -\frac{23}{3}\right)$: Test Point $x = -10$: $\frac{2[-10]-3}{[-10]+4} \stackrel{?}{\leq} 5$</p> $\frac{-23}{-6} \stackrel{?}{\leq} 5$ $\frac{23}{6} \stackrel{?}{\leq} 5 \text{ True}$ <p>2. $\left(-\frac{23}{3}, -4\right)$: Test Point $x = -5$: $\frac{2[-5]-3}{[-5]+4} \stackrel{?}{\leq} 5$</p> $\frac{-13}{-1} \stackrel{?}{\leq} 5$ $13 \stackrel{?}{\leq} 5 \text{ False}$ <p>3. $(-4, +\infty)$: Test Point $x = 10$: $\frac{2[10]-3}{[10]+4} \stackrel{?}{\leq} 5$</p> $\frac{17}{14} \stackrel{?}{\leq} 5 \text{ True}$	

8	Solution: $\left(-\infty, -\frac{23}{3}\right] \cup (-4, +\infty)$	
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Graph of the solution set:

