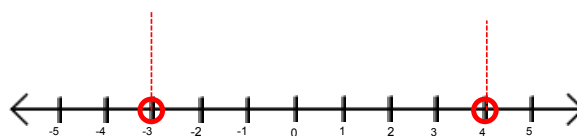


Solutions

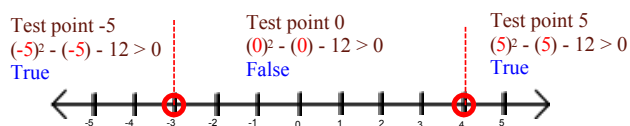
Solve the related equation to determine intervals of numbers that may be solutions of the inequality.

$$\begin{aligned}x^2 - x - 12 &= 0 \\(x - 4)(x + 3) &= 0 \\x - 4 = 0 \text{ or } x + 3 &= 0 \\x = 4 \quad \quad \quad x &= -3\end{aligned}$$

Plot the solutions on a number line creating the intervals for investigation.



Pick a number from each interval to test in the original inequality. If the number tested satisfies the inequality, then all of the numbers in that interval are solutions.



State the solution set.

The solution set is $\{x \mid x < -3 \text{ or } x > 4, x \in \mathbb{R}\}$.

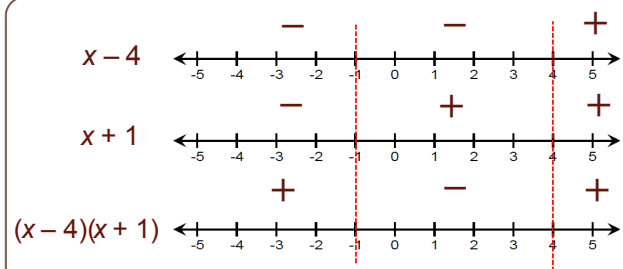
Go back to the question.

Solutions

Solve the related quadratic equation to obtain the boundary points for the intervals.

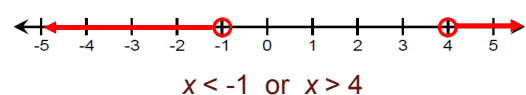
$$\begin{aligned}x^2 - 3x - 4 &= 0 \\(x - 4)(x + 1) &= 0 \\x - 4 = 0 \text{ or } x + 1 &= 0 \\x = 4 \text{ or } x &= -1\end{aligned}$$

Use the boundary points to mark off test intervals on the number line.



Determine the intervals when each of the factors is positive or negative.

Determine the solution using the number line.



Go back to the question.

Example 3**Solve a Quadratic Inequality in One Variable**Solve $2x^2 - 7x > 12$.**Solution**First, rewrite the inequality as $2x^2 - 7x - 12 > 0$.Solve the related equation $2x^2 - 7x - 12 = 0$ to find the roots.Use the quadratic formula with $a = 2$, $b = -7$, and $c = -12$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

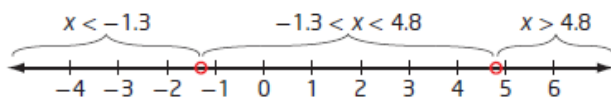
$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(-12)}}{2(2)}$$

$$x = \frac{7 \pm \sqrt{145}}{4}$$

$$x = \frac{7 + \sqrt{145}}{4} \quad \text{or} \quad x = \frac{7 - \sqrt{145}}{4}$$

$$x \approx 4.8 \quad \quad \quad x \approx -1.3$$

Use a number line and test points.

Choose a test point from each of the three intervals, say -3 , 0 , and 6 , to determine whether the results satisfy the original quadratic inequality.

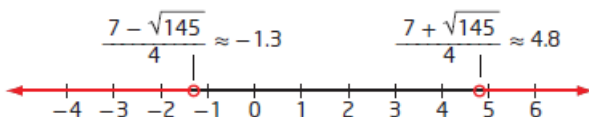
Use a table to organize the results.

Use a table to organize the results.

Interval	$x < \frac{7 - \sqrt{145}}{4}$	$\frac{7 - \sqrt{145}}{4} < x < \frac{7 + \sqrt{145}}{4}$	$x > \frac{7 + \sqrt{145}}{4}$
Test Point	-3	0	6
Substitution	$2(-3)^2 - 7(-3)$ $= 18 + 21$ $= 39$	$2(0)^2 - 7(0)$ $= 0 + 0$ $= 0$	$2(6)^2 - 7(6)$ $= 72 - 42$ $= 30$
Is $2x^2 - 7x > 12$?	yes	no	yes

Therefore, the exact solution set is

$$\left\{ x \mid x < \frac{7 - \sqrt{145}}{4} \text{ or } x > \frac{7 + \sqrt{145}}{4}, x \in \mathbb{R} \right\}.$$



Can you solve this inequality using sign analysis and case analysis?