
1 (10 pts). Solve the inequality. Write the solution set in interval form.

a. $|2x - 3| \geq 10$

b. $|3x - 1| < 7$

1.(Source: 1.2.more.2be) First rewrite the problem in equivalent form without the absolute value symbols. To do this, just remember that absolute value is distance from 0.

a. For $2x - 3$ to have absolute value ≥ 10 means that $2x - 3$ is a number at least 10 units away from zero on the number line. $2x - 3$ must be either ten or more units to the right of zero, or ten or more units to the left of zero. To say the same with inequalities,

$$2x - 3 \leq -10 \quad \text{or} \quad 2x - 3 \geq 10.$$

Solving these,

$$\begin{array}{ll} 2x - 3 \leq -10 & 2x - 3 \geq 10 \\ 2x \leq -7 & 2x \geq 13 \\ x \leq -7/2 & \text{or} \quad x \geq 13/2. \end{array}$$

The solution set is $(-\infty, -7/2] \cup [13/2, \infty)$.

b. For $3x - 1$ to have absolute value less than 7 means that $3x - 1$ is less than 7 units away from 0, so

$$-7 < 3x - 1 < 7.$$

Solve by adding 1 and then dividing by 3:

$$\begin{array}{l} -6 < 3x < 8 \\ -2 < x < 8/3 \end{array}$$

and the solution set is $(-2, 8/3)$.

(done)

Use the book! This quiz was practically the same as Examples 5(a) and 6 in Sect. 1.2.

In math, when we write two or more statements, we must join them either by the word “and” or the word “or,” and by “or” we always mean the non-exclusive “or,” as in “one or the other or both.” For instance, if I say

$$x^2 = 9 \quad \text{and} \quad x > 0$$

I mean, in effect, $x = 3$. If, instead, I say

$$x^2 = 9 \quad \text{or} \quad x > 0,$$

I mean, in effect, that $x = -3$ or any positive number.

In general, if A is a positive number, then $|\text{something}| \leq A$ is equivalent to two inequalities joined by “and,” and $|\text{something}| \geq A$ is equivalent to two inequalities joined by “or.” Whenever we write two inequalities in one line, as in the solution to part b, we mean them to be joined by “and.”