Absolute Value:

- Distance a number is from zero.
- Distance is a POSITIVE quantity.

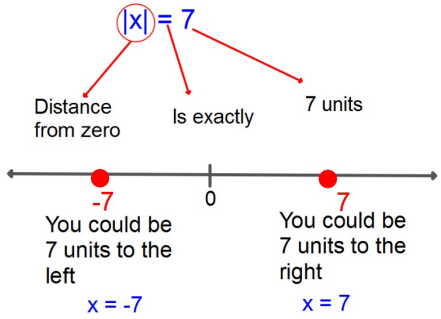
Solve for x: $|x| = 7$

If $|x| = k$, then

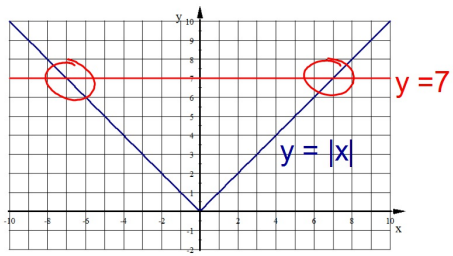
either $|x| = k$

or

$|x| = -k$



Solve: $|x| = 7$



These two graphs are equal where they intersect.

Since they interect where x = 7 and x = -7 these are the two solutions to the equation.

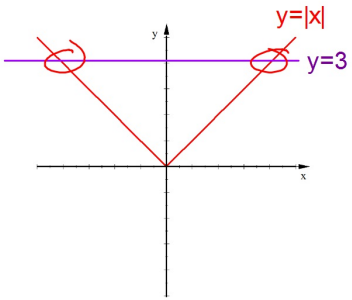
$x = \pm 7$

How many solutions could an Absolute Value Equation have?

2 solutions

$|x| = 3$

Two points of intersection

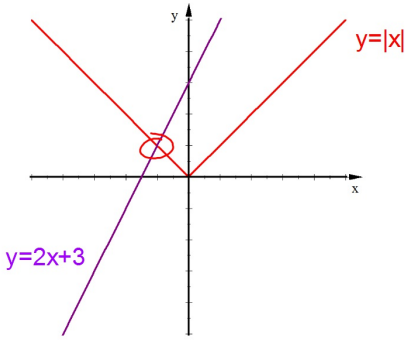


How many solutions could an Absolute Value Equation have?

1 solution

$|x| = 2x + 3$

Only one point of intersection

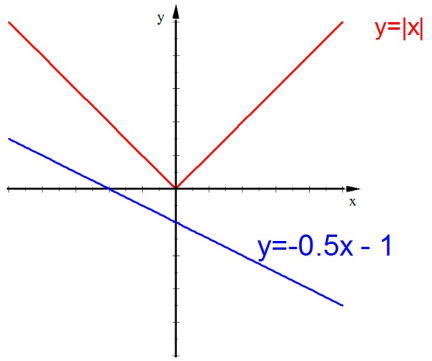


How many solutions could an Absolute Value Equation have?

No solution

$|x| = -0.5x - 1$

No point of intersection



Solve: $|3x + 10| = 6$

exactly 6 units

DISTANCE FROM zero

exactly 6 units from zero
could be at -6 or +6

Solve both eq's

$3x + 10 = -6$ or $3x + 10 = 6$

$-10 \quad -10 \qquad -10 \quad -10$

$3x = -16 \qquad 3x = -4$

$x = -\frac{16}{3} \qquad x = -\frac{4}{3}$

Solve: $3|x + 1| - 5 = 28$

exactly 11 units from zero
could be at -11 or +11

Then find the solutions.

$+5 \quad +5$

$\frac{3|x+1|}{3} = \frac{33}{3}$

First:
Isolate the Abs Value

$|x+1| = 11$

$x + 1 = -11$ or $x + 1 = 11$

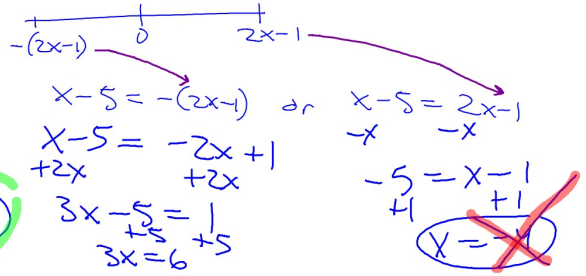
$-1 \quad -1 \qquad -1 \quad -1$

$x = -12$ or $x = 10$

$x = -12, 10$

Solve: $|x - 5| = 2x - 1$

exactly 2x-1 units from zero
could be at -(2x-1) or +(2x-1)



$x-5 = -(2x-1)$ or $x-5 = 2x-1$

$x-5 = -2x+1$ $\quad -x \quad -x$

$+2x \quad +2x$

$-5 = x-1$

$3x-5 = 1$ $\quad +1 \quad +1$

$+5 \quad +5$

$x = -4$

$3x = 6$

$x = 2$

If you check your solutions you find the -4 doesn't make the original equation true.

x = -4 is called an EXTRANEOUS SOLUTION

X=2 is the only solution.

$|x+3| = -2x+1$

$x+3 = -(-2x+1)$ or $x+3 = -2x+1$

$x+3 = 2x-1$ $\quad +2x \quad +2x$

$-x \quad -x$

$3x+3 = 1$

$3 = x-1$ $\quad -3 \quad -3$

$+1 \quad +1$

$3x = -2$

$x = -4$ extraneous sol.

$x = -\frac{2}{3}$