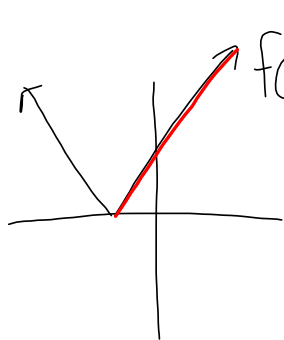


# 7.3 Solving Absolute Value Equations



$$f(x) = |\text{linear}|$$



$$f(x) = |\text{quad}|$$

- 2 solns
- $\infty$  solns
- 1 soln
- 0 solns

- $\infty$  solns
- 1 soln
- 2 solns
- 3 solns
- 4 solns
- 0 solns

To solve absolute value equations, we use the piecewise functions.

ex) Solve  $|x-3|=7$

$$\begin{array}{l}
 \begin{array}{c} + \\ \swarrow \\ x-3=7 \\ +3 \quad +3 \\ x=10 \end{array}
 \qquad
 \begin{array}{c} - \\ \searrow \\ -(x-3)=7 \\ x-3=-7 \\ +3 \quad +3 \\ x=-4 \end{array}
 \end{array}$$

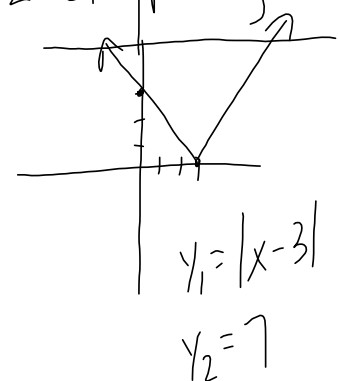
Verify by:

1. Substitution

$$|10-3|=7 \checkmark$$

$$|-4-3|=7 \checkmark$$

2. Graphing



$$\text{ex) } |6-x| = 2$$

+      -

$$6-x=2 \quad -(6-x)=2$$

$$4=x \quad 6-x=-2$$

$$\checkmark \quad 8=x$$

$$\checkmark$$

$$\text{ex) Solve } |x+5| = 4x-1$$

+      -

$$x+5=4x-1 \quad -(x+5)=4x-1$$

$$6=3x \quad -x-5=4x-1$$

$$2=x \quad -4=5x$$

$$\frac{-4}{5} = \frac{5x}{5}$$

$$\cancel{\frac{-4}{5} = x}$$

$$|2+5| = 4(2)-1$$

$$|7| = 8-1$$

$$7=7$$

$$\left| -\frac{4}{5} + 5 \right| = 4\left(-\frac{4}{5}\right) - 1$$

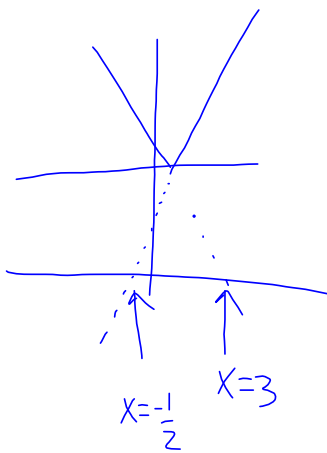
$$\left| 4\frac{1}{5} \right| = -\frac{21}{5}$$

$$\left| 4.2 \right| = -4.2$$

x

ex) Solve  $|4x-5| + 9 = 2$   
 $\quad\quad\quad -9 \quad -9$

Isolate the ABS first.



$$|4x-5| = -7$$

$$\begin{array}{l} + \\ \swarrow \quad \searrow \\ 4x-5 = -7 \quad -(4x-5) = -7 \end{array}$$

$$4x = -2$$

$$\underline{x = -\frac{1}{2}}$$

$$4x-5 = 7$$

$$4x = 12$$

$$\underline{x = 3}$$

0 solutions

$$x = \emptyset$$

or  $x = \{ \}$  ← empty set

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# 2, 4, 5, 15, 19, 21, 23, 24