

2.5 Absolute Value Equations and Inequalities

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Absolute Value

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Recall, the absolute value of x , $|x|$, is the distance of x from the origin (always positive). We can define the absolute value of x piecewise as

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$



Example

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Rewrite as a piecewise defined function and sketch the graph:

$$g(x) = |1 - x|$$



Absolute Value Equations

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The equation

$$|ax + b| = c \quad (c > 0)$$

is equivalent to

$$ax + b = c \text{ or } ax + b = -c$$



Example

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- Solve $|2 - 3x| = 1$
- Solve $|4.5 - 2x| + 1.1 = 9.7$



Absolute value inequalities

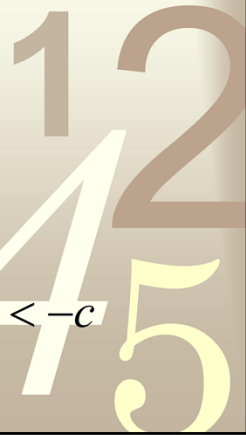
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The inequality $|ax + b| < c$

is equivalent to $-c < ax + b < c$

The inequality $|ax + b| > c$

is equivalent to $ax + b > c$ or $ax + b < -c$



Examples

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- Solve $|-3x + 1| \leq 5$

- Solve $|5x - 7| > 2$



Example

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If $f(x)$ is the red curve shown and $g(x)$ is the green curve shown, find where $f(x) < g(x)$

