Solving Absolute Equations

Date:

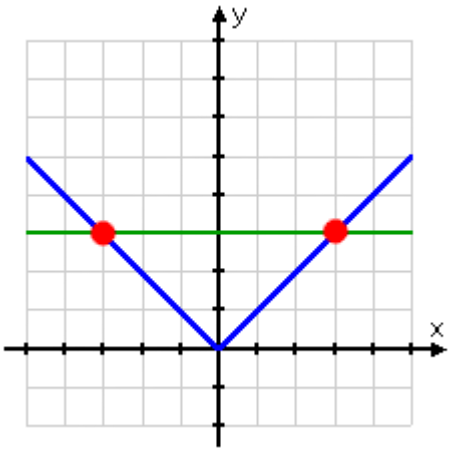
When you take the absolute value of a number, you always end up with a positive number (or zero). Whether the input was positive or negative (or zero), the output is always positive (or zero). For instance, | 3 | = 3, and | –3 | = 3 also.

Example 1: Absolute Numbers

Evaluate $|5|-|-9|+3|5-12|$

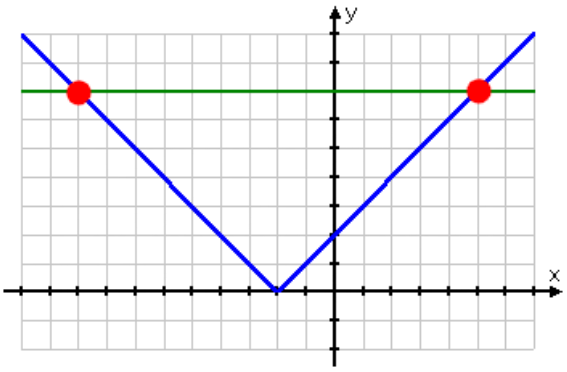
Example 2: Solving Absolute Equations

Solve | x | = 3



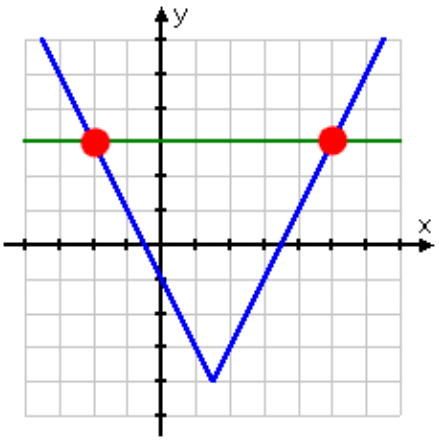
Example 3: Solving Absolute Equations

Solve | x + 2 | = 7



Example 4: Solving Absolute Equations

Solve | 2x – 3 | – 4 = 3



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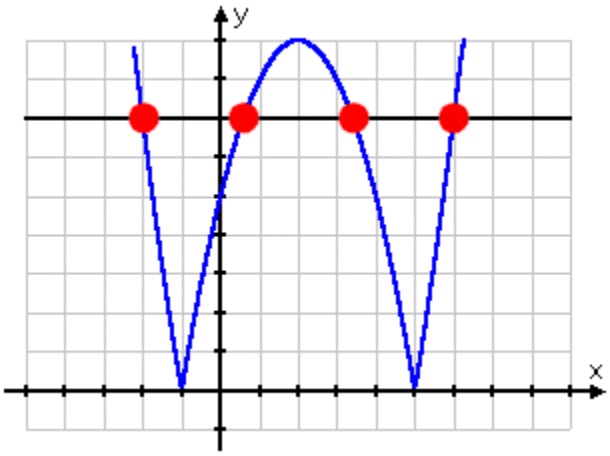
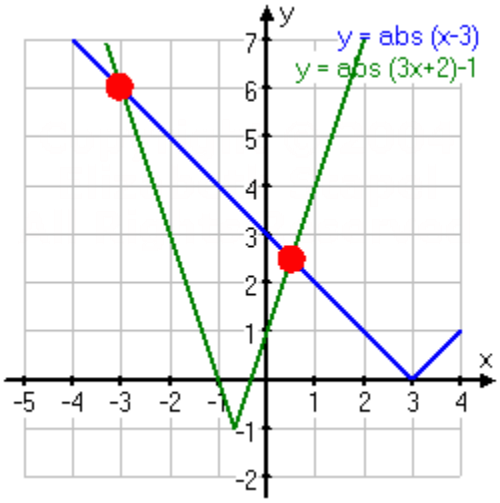
Example 5: Solving Absolute Equations

Solve $| x^2 - 4x - 5 | = 7$



Example 6: Solving Absolute Equations

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



Homework:
Handout: Equations and Inequalities containing Absolute Values
#1,3,4,5,6ab,7abcgh,8a-h

Solving Absolute Equations

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1. Evaluate each of the following:
   a) $|-3-7|$ b) $|4|+|-15|$ c) $|3|-|-5|+|3-9|$ d) $|9-3|+5|-3|-3|7-12|$

2. Graph each of the following on the number line, for $x \in R$. Rewrite each statement without the absolute value bars.
   a) $|x| \le 2$ b) $|x| > 3$ c) $|x| < 4$ d) $|x| \ge 2$

3. Graph each of the following absolute value functions, $x \in R$.
   a) $f(x) = |x-3|$ b) $g(x) = |x+5|$ c) $h(x) = |2x+5|$ d) $m(x) = |3x-6|$
   e) $f(x) = |4-3x|$ f) $g(x) = |1-2x|$

4. Graph each of the following absolute value functions, $x \in R$.
   b) $y = |x^2-4|$ b) $y = |x^2-1|$ c) $y = |x^2-2x|$ d) $y = |x^2+4x|$
   e) $y = |x^3-1|$ f) $y = |x^3|$

5. Graph each of the following functions:
   a) $y = |x^2-x-6|$ b) $y = |-2x^2+4x-3|$ c) $y = |x^3-x|$

6. Solve for x, $x \in R$
   a) $|2x-1| = 7$ b) $|3x+2| = 6$ c) $|x-3| \le 9$ d) $|x+4| \ge 5$
   e) $|2x-3| < 4$ f) $|x| = -5$

7. Solve for x, $x \in R$
   a) $|x| = 3x+4$ b) $|x-5| = 4x+1$ c) $|4x-8| = 2x$ d) $|x-1| < x$
   e) $|2x+4| \ge 12x$ f) $|3x-1| \le 5|3x-1|-16$
   g) $|x-2|+|x| = 6$ h) $|x+4|-|x-1| = 3$

8. Solve for x, $x \in R$
   a) $|2x+4|+|x-1|-2 = 0$ b) $|2x+4|+|x-1|-3 = 0$ c) $|2x+4|+|x-1|-4 = 0$
   d) $|2x+4|+|x-1|-5 = 0$ e) $|3x-6|-|x+5|+6 = 0$ f) $|3x-6|-|x+5|+4 = 0$
   g) $|3x-6|-|x+5|-5 = 0$ h) $|3x-6|-|x+5|+10 = 0$ i) $|3x+6| \ge 18x$
   j) $|3x+6| \ge 9x$ k) $|3x+6| \le 5x$ l) $|3x+6| \le 2x$

Answers

1a) 10 b) 19 c) 4 d) 6 2a) $-2 \le x \le 2$ b) $x > 3$ or $x < -3$ c) $-4 \le x \le 4$ d) $x \ge 2$ or $x \le -2$

6a) 4, -3 b) $\frac{4}{3}, \frac{-8}{3}$ c) $-6 \le x \le 12$ d) $x \ge 1$ or $x \le -9$ e) $\frac{-1}{2} < x < \frac{7}{2}$ f) No solution

7a) -1 b) 0.8 c) $4, \frac{4}{3}$ d) $x > \frac{1}{2}$ e) $x \le \frac{2}{5}$ f) $x \le -1$ or $x \ge \frac{5}{3}$ g) -2, 4 h) 0

8a) No solution b) -2 c) $\frac{-7}{3}, -1$ d) $\frac{-8}{3}, 0$ e) $\frac{5}{2}, \frac{7}{4}$ f) $\frac{5}{4}, \frac{7}{2}$ g) -1, 8 h) No solution i) $x \le \frac{2}{5}$

j) $x \le 1$ k) $x \ge 3$ l) No solution