

Lesson 2 Solving Absolute Value Equations

Solving an Absolute value Equation graphically

Solve, graphically.

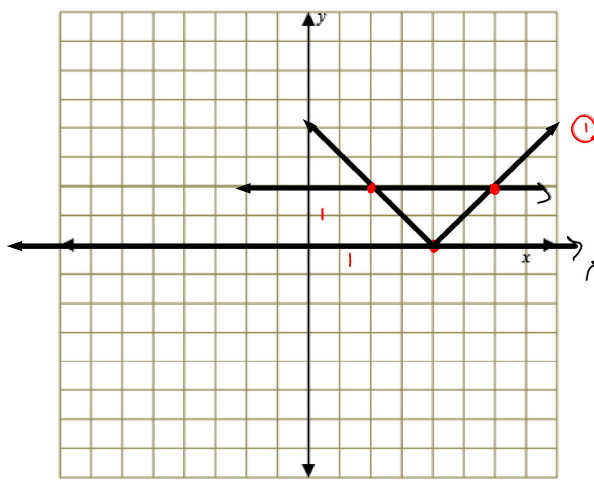
1. $|x - 4| = 2$

① sketch $y = |x - 4|$

② sketch $y = 2$

Sol'n is the x-values of the points of intersection of the graphs

$\therefore x = 2, 6$



$y = 0$
 $y = |x - 4|$

Identify the values of c for which the equation $|x - 4| = c$ has

a.) one solution.

$c = 0$

b.) no solution.

$c < 0$

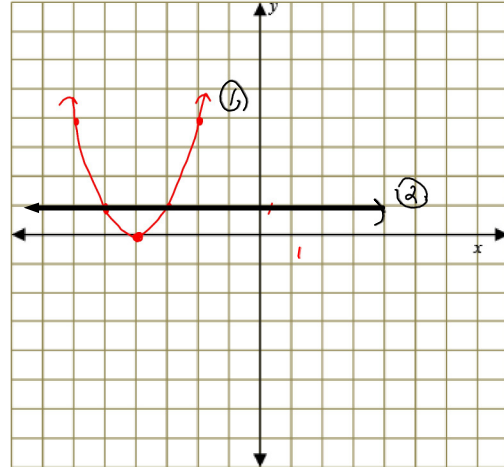
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Pre-Calculus 11 Enriched Absolute Value & Reciprocal Functions

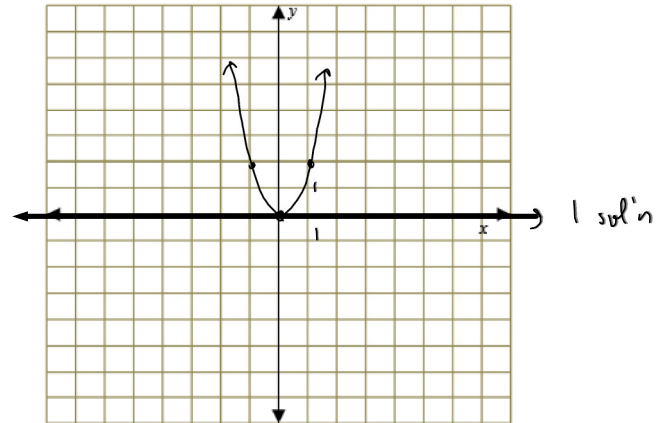
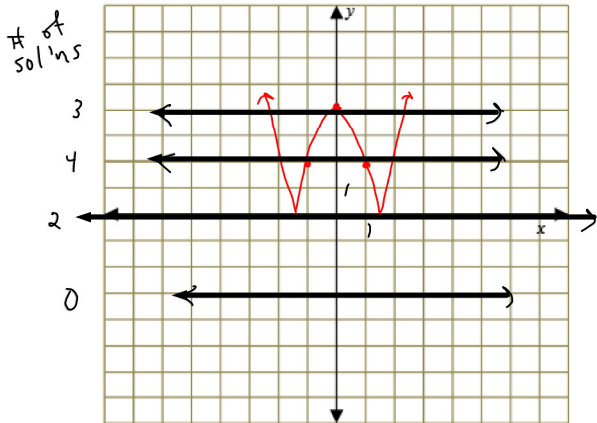
2. $|x^2 + 8x + 16| = 1$

- ① sketch $y = x^2 + 8x + 16$
 $y = (x+4)^2$ $y = |x+4|^2$
same graph
- ② sketch $y = 1$

sol'n
 $x = -5, -3$



An absolute value equation for the form $|ax^2 + bx + c| = d$ can have 0, 1, 2, 3, or 4 solutions. The number of solutions depends on the absolute value function graphed and the value of d .



Solving Absolute Value Equations Algebraically

1. $|3x + 1| = 7$

$$3x + 1 = 7 \quad \text{or} \quad -(3x + 1) = 7$$

$$3x = 6 \quad 3x + 1 = -7$$

$$x = 2 \quad 3x = -8$$

$$x = -\frac{8}{3}$$

check

$$|3(2) + 1| = 7$$
$$|7| = 7$$
$$7 = 7 \checkmark$$

$$|3(-\frac{8}{3}) + 1| = 7$$

$$|-7| = 7$$

$$7 = 7 \checkmark$$

2. $2|2x - 1| = 4x$

$$|2x - 1| = 2x$$

* Always isolate the absolute value first!

$$2x - 1 = 2x \quad \text{or} \quad -(2x - 1) = 2x$$

$$-1 = 0 \quad 2x - 1 = -2x$$

\therefore no sol'n
(in this branch)

$$4x = 1$$

$$x = \frac{1}{4}$$

check

$$2|2(\frac{1}{4}) - 1| = 4(\frac{1}{4})$$

$$2|\frac{1}{2} - 1| = 1$$

$$2|-\frac{1}{2}| = 1$$

$$2(\frac{1}{2}) = 1$$
$$1 = 1 \checkmark$$

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Pre-Calculus 11 Enriched Absolute Value & Reciprocal Functions

$$3. |x^2 - 3x| = -4x + 6$$

$$x^2 - 3x = -4x + 6 \quad \text{or}$$

$$x^2 + x - 6 = 0$$

$$(x+3)(x-2) = 0$$

check $x = -3$ ✓ ~~$x = 2$~~ reject

$$|(-3)^2 - 3(-3)| = -4(-3) + 6$$

$$|18| = 18$$

$$18 = 18 \checkmark$$

$x=2$

$$|2^2 - 3(2)| \neq -4(2) + 6$$

$$|-2| \neq -2$$

$$2 \neq -2$$

$$-(x^2 - 3x) = -4x + 6$$

$$x^2 - 3x = 4x - 6$$

$$x^2 - 7x + 6 = 0$$

$$(x-6)(x-1) = 0$$

check ~~$x=6$~~ reject $x=1$ ✓

$$|6^2 - 3(6)| \neq -4(6) + 6$$

$$|18| \neq -18$$

$$18 \neq -18$$

$$|1^2 - 3(1)| = -4(1) + 6$$

$$|-2| = 2$$

$$2 = 2 \checkmark$$

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 # 2 a, b, ~~x~~
 3 b, ~~x~~, f, g, ~~x~~
 4 a, ~~x~~, e, f, i, ~~x~~
 7, 10, ~~x~~