C11 - 7.1 - Absolute Value: $|x|$ Notes

$|2| =$
$|2| = 2$

$|-3| = 3$

$|2-4| =$
$|-2| = 2$

$|3| - |-5| =$
$3 - 5 = -2$

$-|3| = -3$

$-|-5| =$
$-(5) = -5$

Do whatever is inside the absolute value, then make it positive.

Solve algebraically.

$|x| = 4$

"+" case:

$+(x) = 4$
$x = 4$

"−" case:

$-(x) = 4$
$x = -4$

$|x| = -6$
Impossible.

Distribute a positive into the absolute value

Distribute a negative into the absolute value

$|x| = 4$
$|4| = 4$
$4 = 4$ ✓

$|x| = 4$
$|-4| = 4$
$4 = 4$ ✓

Check your answer. (Left Hand Side LHS = RHS Right Hand Side)

$|x-2| = 2$

"+" case:

$+(x-2) = 2$
$x - 2 = 2$
$x = 4$

"−" case:

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

$|x-2| = 2$
$|4-2| = 2$
$|2| = 2$ ✓

$|x-2| = 2$
$|0-2| = 2$
$|-2| = 2$ ✓

$2|x-2| = 6$

"+" case:

$+2(x-2) = 6$
$2x - 4 = 6$
$2x = 10$
$x = 5$

"−" case:

$-2(x-2) = 6$
$-2x + 4 = 6$
$-2x = 2$
$x = -1$

$2|x-2| = 6$
$2|5-2| = 6$
$2|3| = 6$ ✓

$2|x-2| = 6$
$2|-1-2| = 6$
$2|-3| = 6$ ✓

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

"+" case:

$+(x^2-1) = x - 1$
$x^2 - x = 0$
$x(x-1) = 0$

$x = 0$ ✗

$x - 1 = 0$
$x = 1$

"−" case:

$-(x^2-1) = x - 1$
$-x^2 + 1 = x - 1$
$x^2 + x - 2 = 0$
$(x+2)(x-1) = 0$

$x - 1 = 0$
$x = 1$

$x + 2 = 0$
$x = -2$ ✗

$|x^2 - 1| = x - 1$
$|0^2 - 1| = 0 - 1$
$|-1| = -1$ ✗

$|x^2 - 1| = x - 1$
$|1^2 - 1| = 1 - 1$
$|0| = 0$ ✓

$|x^2 - 1| = x - 1$
$|(-2)^2 - 1| = -2 - 1$
$|4 - 1| = -2 - 1$
$|3| = -3$ ✗

C11 - 7.1 - Absolute Value Inequalities: $|x|$ Notes

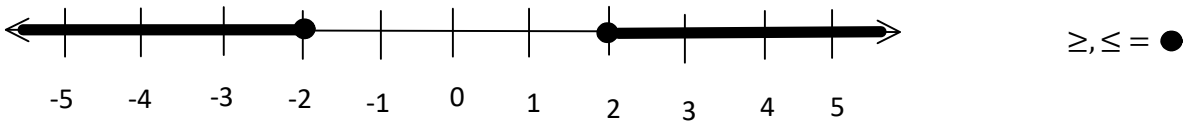
$|x| \geq 2$

"+" case: "−" case:

$+(x) \geq 2$
$x \geq 2$

$-(x) \geq 2$
$x \leq -2$

Divide by a negative, change direction of sign.



≥, ≤ = ●

Shade greater than two, and less than negative two.

Check your answer. Test values in shaded region.

$|3| \geq$
$|3| \geq 3$
$3 \geq 2$ ✓

$|-3| \geq$
$|-3| \geq$
$3 \geq 2$ ✓

$|x - 3| < 2$

"+" case: "−" case:

$+(x - 3) < 2$
$x - 3 < 2$
$x < 5$

$-(x - 3) < 2$
$-x + 3 < 2$
$-x < 2$
$x > -2$

Divide by a negative, change direction of sign.

>, < = ○

Shade less than five, and greater than negative two.

Check your answer. Test values in shaded region.

$|3| \geq$
$|3| \geq 3$
$3 \geq 2$ ✓

$|-3| \geq$
$|-3| \geq$
$3 \geq 2$ ✓