Name: ____________________________

Chapter 7 Re-Cap:
Absolute Value

For a real number a, the **absolute value** is always the non-negative value of the number. We show absolute value with two vertical lines, like brackets.

Ex. 1: $|7| = 7$ $\quad |-7| = 7$ $\quad -|6-10| = -4$ $\quad 5-2|-3| = 5-2(3)$
$= 5-6$
$= -1$

In general: $|a| = \begin{cases} a, a \geq 0 & + \\ -a, a < 0 & - \end{cases}$

Absolute values will require the use of **piecewise notation**. This is because the function is made up of two or more separate functions with its own domain and range. They will combine to the overall function.

Ex. 2: Determine the piecewise notation for the expression

a) $|4-x| = \boxed{\begin{cases} 4-x, & x \leq 4 \\ -4+x, & x > 4 \end{cases}}$

$\oplus$: $4-x \geq 0$
$4 \geq x$

$\ominus$ $4-x < 0$
$4 < x$

b) $|2x-1| = \boxed{\begin{cases} 2x-1, & x \geq 1/2 \\ -2x+1, & x < 1/2 \end{cases}}$

$\oplus$ $2x-1 \geq 0$
$2x \geq 1$
$x \geq 1/2$

$\ominus$ $2x-1 < 0$
$x < 1/2$

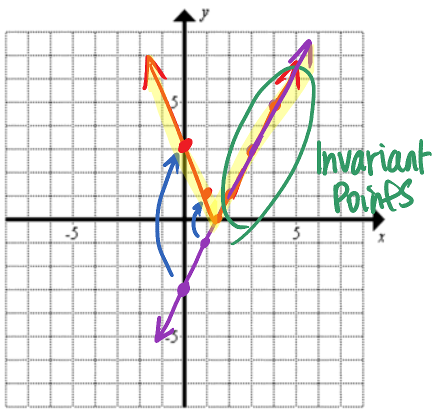
Ex. 3: Consider the absolute value function $y = |2x-3|$

a) Sketch the graph.
b) Express the graph with piecewise notation.

Sketch $y = 2x-3$

$\boxed{y = \begin{cases} 2x-3, & x \geq 3/2 \\ -2x+3, & x < 3/2 \end{cases}}$

$\oplus$ $2x-3 \geq 0$
$x \geq 3/2$



An invariant point is any point that remains unchanged when a transformation is applied to it.

Solving absolute value equations:

1. Consider the positive and negative case for each absolute value:
2. Solve each case.
3. Check solution(s) by substituting the solution back into the ORIGINAL equation. Reject any that do not work.

Ex. 4: Solve $|2x-5| = 5-3x$

Case +: $2x-5=5-3x$

$5x-5=5$

$5x=10$

$x=2$

extraneous root!

Case −: $-2x+5=5-3x$

$x+5=5$

$x=0$

Check:

$|2(2)-5|=5-3(2)$

$|-1|=-1$ ✗

$|2(0)-5|=5-3(0)$

$|-5|=5$ ✓

$\boxed{\text{only } x=0}$

Ex. 5: Solve $|x-10| = x^2-10x$

Case +: $x-10=x^2-10x$

$0=x^2-11x+10$

$0=(x-10)(x-1)$

$x=10,\ 1$

Case −: $-x+10=x^2-10x$

$0=x^2-9x-10$

$0=(x-10)(x+1)$

$x=10,-1$

Check:

$|10-10|=(10)^2-10(10)$ ✓

$|1-10|=(1)^2-10(1)$ ✗

$|-1-10|=(-1)^2-10(-1)$ ✓

$\boxed{\text{only } x=10,-1}$

Practice: ~~Pg. 410: # 1 – 3, 5 – 12~~ Review Worksheet