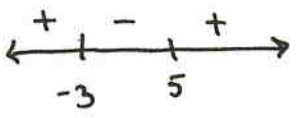
IB Math 1 2H.2 Modulus Equations and Inequalities

Warm Up: Write without modulus: $g(x)=\left|x^2-2x-15\right|$

$g(x) = |(x-5)(x+3)|$

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




$$g(x) = \begin{cases} x^2-2x-15, & x \geq 5 \\ -(x^2-2x-15), & -3 < x < 5 \\ x^2-2x-15, & x \leq -3 \end{cases}$$

$|x| = 2$
$x^2 = 4$
} same solutions!

Solve for x

1. $\left|x+5\right|=18$

OLD METHOD

$x+5 = 18$ OR $x+5 = -18$

$x = 13$, $x = -23$

NEW METHOD

$(x+5)^2 = 18^2$

$x^2+10x+25 = 324$

$x^2+10x-299 = 0$

$(x-13)(x+23) = 0$

$x = 13, -23$

2. $\left|\frac{3x+2}{1-x}\right| = 4$

$\frac{3x+2}{1-x} = 4$ or $\frac{3x+2}{1-x} = -4$

$3x+2 = 4-4x$ $\qquad$ $3x+2 = -4+4x$

$7x = 2$ $\qquad$ $6 = x$

$x = \frac{2}{7}$

$\boxed{x = \frac{2}{7}, 6}$

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

New Method!

$(x+1)^2 = (2x-3)^2$

$x^2+2x+1 = 4x^2-12x+9$

* square both sides

$0 = 3x^2-14x+8$

$0 = (3x-2)(x-4)$

$\boxed{x = \frac{2}{3}, 4}$

4. $|2x-9|<4$

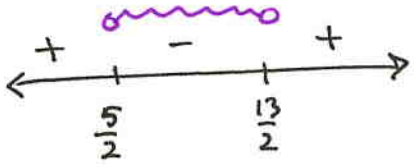
$(2x-9)^2 < 4^2$

$4x^2 - 36x + 81 < 16$

$4x^2 - 36x + 65 < 0$

$(2x-5)(2x-13) < 0$

less than zero means negative




$\left(\frac{5}{2}, \frac{13}{2}\right)$

5. $2|x-1| \geq |3-x|$

$(2(x-1))^2 \geq (3-x)^2$

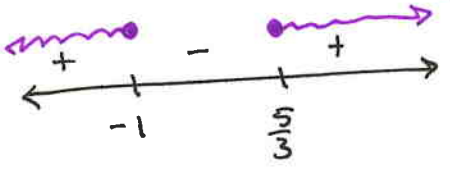
$(2x-2)^2 \geq (3-x)^2$

$4x^2 - 8x + 4 \geq 9 - 6x + x^2$

$3x^2 - 2x - 5 \geq 0$

$(3x-5)(x+1) \geq 0$

greater than zero means positive




$(-\infty, -1] \cup \left[\frac{5}{3}, \infty\right)$

HW 2H.2 (1-3, 5) odd letters