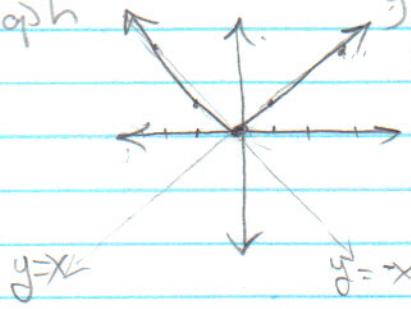
2.5 Absolute Value Functions & Graphs

Parent function: $f(x) = |x|$ graph $y = |x|$

$y = |-3|$
$y = |3|$

① table of values
② graph

x	-3	-1	0	1	3
y	3	1	0	1	3



Domain: All Real $\{-\infty \le x \le \infty\}$ $\{\mathbb{R}\}$
Interval $(-\infty, \infty)$

Range: $\{y \ge 0\}$
Interval $[0, \infty)$
min, max

translation $f(x) = |mx+b| + c \quad m \neq 0$
vertex $\left(\frac{-b}{m}, c\right)$

$y = |x+3| - 2$ vertex $(-3, -2)$
$m=1 \quad b=3$ $\left(\frac{-3}{1}, -2\right)$

Graph with 2 linear equations

$y = |x-3| + 5$ $(3,5)$ vertex

$y-5 = |x-3|$ Domain

- 5

Domain

Case 1 $x-3 \ge 0$ $x \ge 3$

$y-5 = x-3$
$+5 \quad +5$
$y = x+2$

Case 2 negat. $x-3 \le 0$ $x \le 3$

$y-5 = -(x-3)$
$y-5 = -x+3$
$+5 \quad +5$
$y = -x+8$

+3 +3

What if:

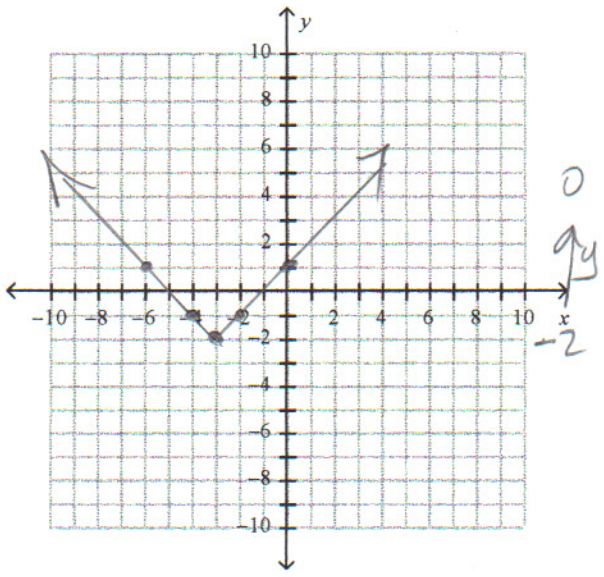
$y = |mx+b| + c$

$mx+b=0$
$-b \quad -b$
$\frac{mx}{m} = \frac{-b}{m}$
$x = -b/m$

$y = |m(\frac{-b}{m}) + b| + c$
$y = c$

Vertex $\left(\frac{-b}{m}, c\right)$

(try example #3)



Graph – vertex – table values & domain-range

$y = |x+3| - 2$ $(-3,-2)$ vertex

$x-h$

$|x-(-3)|$

vertex

x	-6	-4	-3	-2	0
y	1	-1	-2	-1	1

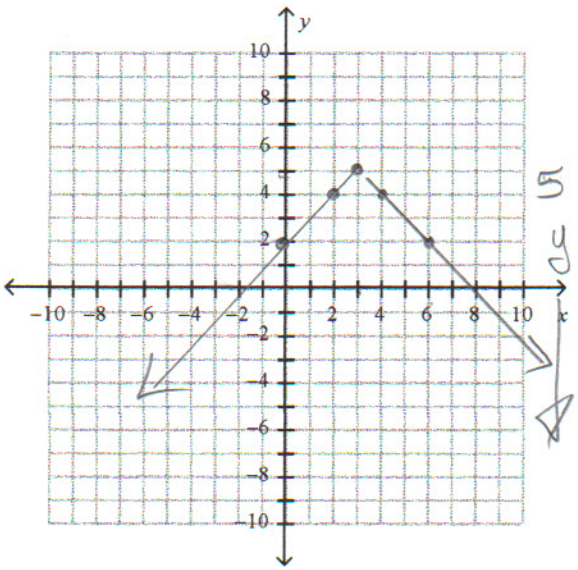
sym

D: $\{-\infty < x < \infty\}$

Interval $(-\infty, \infty)$

R $\{-2 \leq y < \infty)$

Interval $[-2, \infty)$



$y = -|x-3| + 5$ vertex $(3,5)$

$x-(h)$

$x-3=0$

$x=3$

vertex

	0	2	3	4	6
	2	4	5	4	2

Real #

$-|2-3|+5$

$-|-1|+5$

$-1+5$

4

$-|6-3|+5$

$-3+5$

2

$-|0-3|+5$

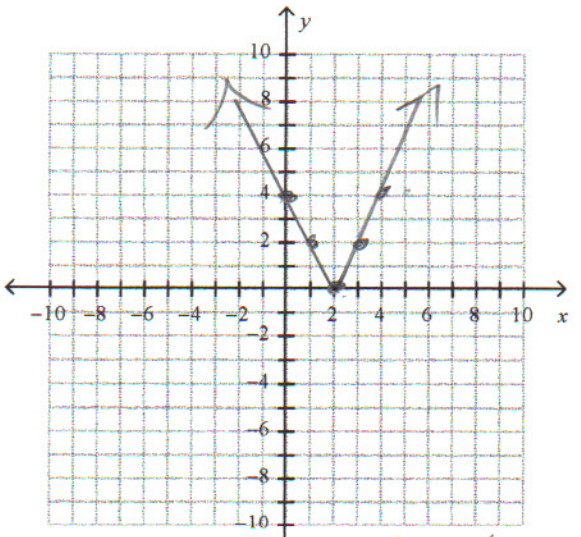
$-3+5$

2

D: $\{-\infty < x < \infty\} \rightarrow (-\infty, \infty)$

R: $\{-\infty < y \leq 5\} \rightarrow (-\infty, 5]$

$\{y \leq 5\}$



$y = |4-2x|$ $\left(\frac{-b}{m}, c\right)$ vertex

$y = |-2x+4|+0$

$mx+b$

$(2,0)$

$x = \frac{-4}{-2} = 2$

x	0	1	2	3	4
y	4	2	0	2	4

min

$y = |-2(3)+4|$

$y = |-2| = 2$

$y = |-2(1)+4|$

$|2| = 2$

$y = |-2(4)+4| = |-4|$

D $\{-\infty < x < \infty\} \rightarrow (-\infty, \infty)$

R $\{y \geq 0\}$ $[0, \infty)$