11 PRECAL

Unit 5

Absolute Value & Reciprocal Functions

Booklet One

May 5th - May 12th

Name: answer key

U5:L1 Absolute Value

Fill in the following notes with help from pages 358-363 or with the notes posted at

Absolute value means only how far the number is from zero...

The absolute value of 9 is 9

The absolute value of -3 is 3

The absolute value of 0 is 0

The absolute value of -156 is 156

So in practice "absolute value" means to remove any negative sign in front of a number, and to think of all numbers as positive (or zero).

For a real number *a*, the absolute value is written as $|a|$ and is a positive number.

So, with proper conventions we write...

The absolute value of 19 is $|19| = 19$

The absolute value of 0 is $|0| = 0$

The absolute value of -3 is $|-3| = -(-3) = 3$

Your turn:

$\|3\|$	$\|-7\|$	$\|9\|$	$\|-12\|$
3	7	9	12

Comparing and Ordering Absolute Values

Write the real numbers in increasing order: → small to big.

$\lvert -6.5 \rvert$	5	$\lvert 4.75 \rvert$	-3.4	$\left\lvert -\frac{12}{5} \right\rvert$	$\lvert -0.1 \rvert$	-0.01	$\left\lvert -2\frac{1}{2} \right\rvert$
6.5	5	4.75	-3.4	2.4	0.1	-0.01	2.5
(8)	(7)	(6)	(1)	(4)	(3)	(2)	(5)

★ Always write answer with ORIGINAL values

$$-3.4 < -0.01 < |-0.1| < \left|-\tfrac{12}{5}\right| < \left|-2\tfrac{1}{2}\right| < |4.75| < 5 < |-6.5|$$

Evaluating Absolute Value Expressions

Follow BEDMAS order of operations rules to solve the following problems:

a) $|4| - |-6|$

$= 4 - 6$

$= -2$

b) $5 - 3|2 - 7|$

$= 5 - 3|-5|$

$= 5 - 3(5)$

$= 5 - 15$

$= -10$

c) $|-2(5-7)^2 + 6|$

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

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

$= |-8 + 6|$

$= |-2|$

$= 2$

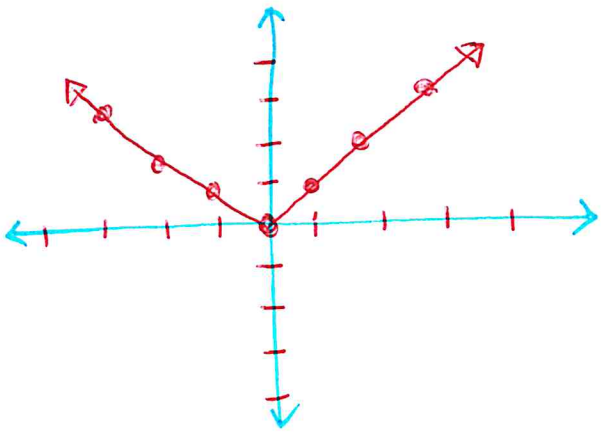
PRACTICE: Page 363 Questions 1, 3 and 6

U5:L2 Absolute Value Functions

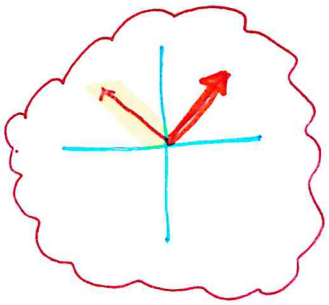
Fill in the following notes with help from pages 368-375 or with the notes posted at

Graph the absolute value graph by filling in the table of values, and graphing these ordered pairs:

x	y
-3	3
-2	2
-1	1
0	0
1	1
2	2
3	3



$$y = |x|$$



- The vertex of this graph is (0,0)
- The vertex splits the graph into two distinct pieces.
- For all negative values of x, the y value is $-x$
- For all positive values of x, the y value is x

Functions that are made up of more than one distinct pieces is called a piecewise function.

Each piece has its own domain, which combined define the overall function.

This is written as:

$$y = f(x) = \begin{cases} -x, if\ x < 0 \\ x, if\ x \geq 0 \end{cases}$$

Piece #1 $y = -x$

Piece #2 $y = x$

Could start as $f(x) =$

Big bracket for 2 Lines of info

Graphing Absolute Value Functions

Find the x and y intercepts of $y = |2x - 3|$

y intercept is when $x = 0$

$y = |2(0) - 3|$
$y = |0 - 3|$
$y = |-3|$
$y = 3$ $(0, 3)$

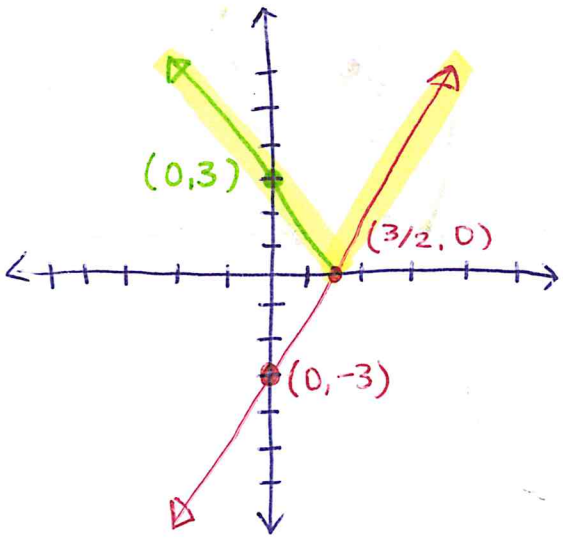
x intercept is when $y = 0$

$0 = |2x - 3|$
$0 = 2x - 3$
$3 = 2x$
$3/2 = x$ $(3/2, 0)$

Graph $y = |2x - 3|$

① Use the graph $y = 2x - 3$

Think of $y = mx + b$
$m = 2$ = SLOPE
$b = -3$ = vertical translation ↓ by 3



② NO $-y$ values are allowed, so REFLECT the $-y$ points to be $\oplus$ (shown in green)

③ All the $+y$ pieces make up the absolute value fuction (highlighted)

Find the domain and range of the function:

domain $\{x \mid x \in \mathbb{R}\}$ ⇒ ALL Real Numbers

Range $\{y \mid y \geq 0, y \in \mathbb{R}\}$

State the piecewise function:

$$y = \begin{cases} 2x - 3, & \text{if } x \geq \frac{3}{2} \\ -(2x - 3), & \text{if } x < \frac{3}{2} \end{cases}$$

Graphing Absolute Value Functions

we can tell just by looking at this equation it is quadratic ∴ a PARABOLA!

Find the x and y intercepts of $y = |-x^2 + 2x + 8|$

y intercept when $x=0$

$y = |-0^2 + 2(0) + 8|$

$y = |0 + 0 + 8|$

$y = |8|$

$y = 8$ $(0,8)$

x intercept when $y=0$

$0 = |-x^2 + 2x + 8|$ $(-2,0)$ $(4,0)$

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

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

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

$0 = x+2$ OR $0 = x-4$

$-2 = x$ $4 = x$

Graph $y = |-x^2 + 2x + 8|$

① Complete the square to convert to VERTEX Form (like in Unit 3!)

$y = -x^2 + 2x + 8$

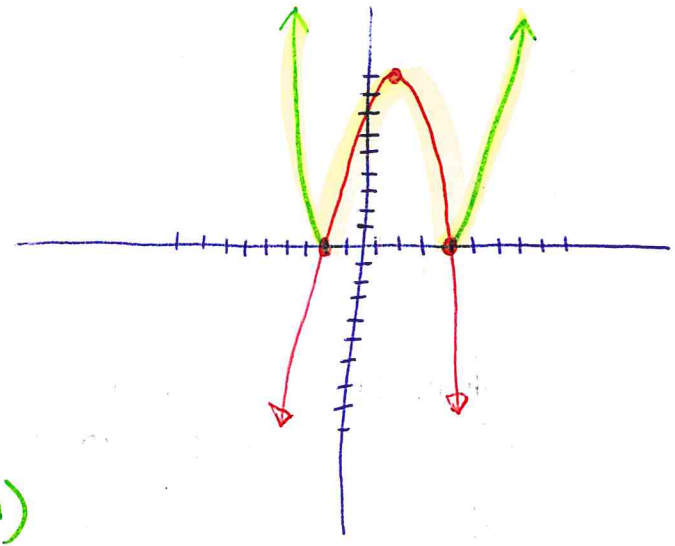
$y = -(x^2 - 2x) + 8$

$y = -(x^2 - 2x + 1 - 1) + 8$

$y = -[(x-1)^2 - 1] + 8$

$y = -(x-1)^2 + 9$

Vertex @ (1,9)
-a = OPENS DOWN } Red on graph



② Reflect the parts that are −y to be +y (green)

③ ALL +y pieces are absolute value function (highlighted)

Find the domain and range of the function:

domain $\{x \mid x \in \mathbb{R}\}$

Range $\{y \mid y \geq 0, y \in \mathbb{R}\}$

State the piecewise function:

$$y = \begin{cases} -x^2 + 2x + 8, & \text{if } -2 \leq x \leq 4 \\ -(-x^2 + 2x + 8), & \text{if } x < -2 \text{ OR } x > 4 \end{cases}$$

PRACTICE: Page 375 Questions 1, 6a, 6c, 8b, 8f, 9a, 10a, and 11a.

☆ Remember, you can always double check answers on YOUR DESMOS APP!