Piecewise Functions (1.6)

Math Learning Target:

"I can graph all piecewise functions.
I know how to apply piecewise functions in a problem.
I know how to determine if a function is continuous.
If a function is discontinuous, I know how to describe the discontinuity."

A **piecewise function** is a function defined by using two or more functions, on two or more intervals.

Recall: $f(x) = |x|$ defines the distance the value x is from the origin.

The absolute value function may be expressed as a piecewise function.

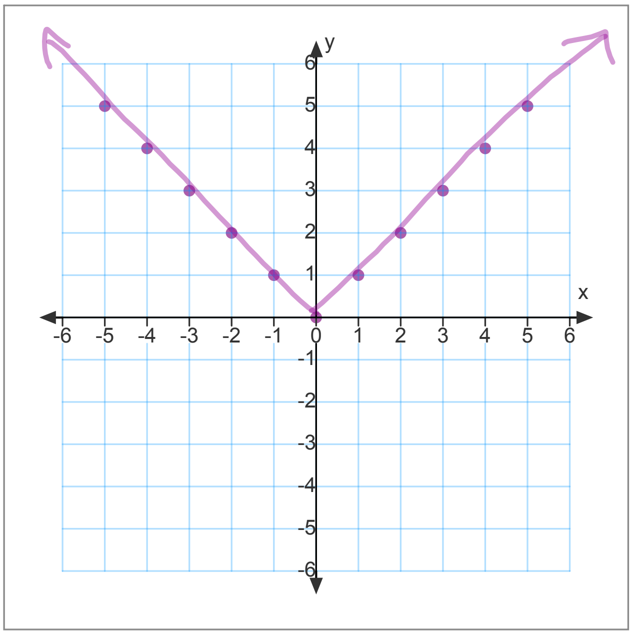
$$f(x) = |x| = \begin{cases} x & \text{when } x > 0 \\ -x & \text{when } x \le 0 \end{cases}$$

if $x=-1$

$f(x)$

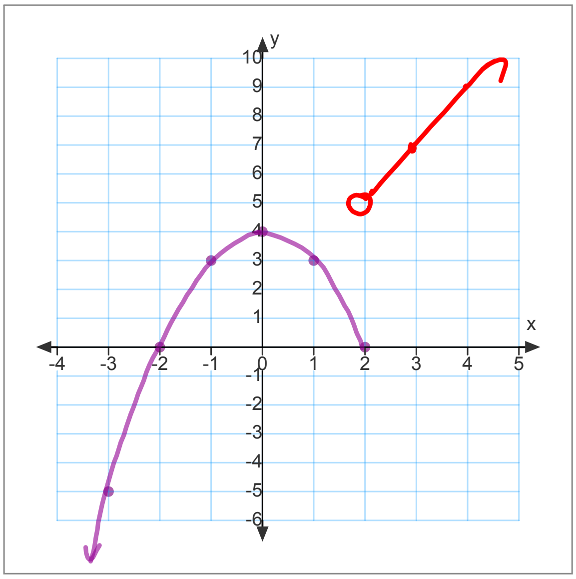
$=-(-1)$

$=1$



Ex. 1: Graph:

$$f(x)=\begin{cases} -x^2+4 & \text{if } x \le 2 \\ 2x+1 & \text{if } x > 2 \end{cases}$$



Click here for the video: "Continuity of Functions: Photostory"
(The video is posted in our Google Classroom for your convenience).

A function is **continuous** when there are no "holes", vertical asymptotes and "jumps" over its entire domain.
If the function is not continuous, it is **discontinuous**

Ex. 2: Is the function in Ex. 1 continuous? Explain.

No, it is discontinuous because there is a "jump".
i.e, the value of both functions at x=2 is not equal.

if $x=2$

$f(2)=-(2)^2+4$
$=-(4)+4$
$=0$ (closed)

$f(2)=2(2)+1$
$=4+1$
$=5$ (open)

If time: Discuss using GeoGebra

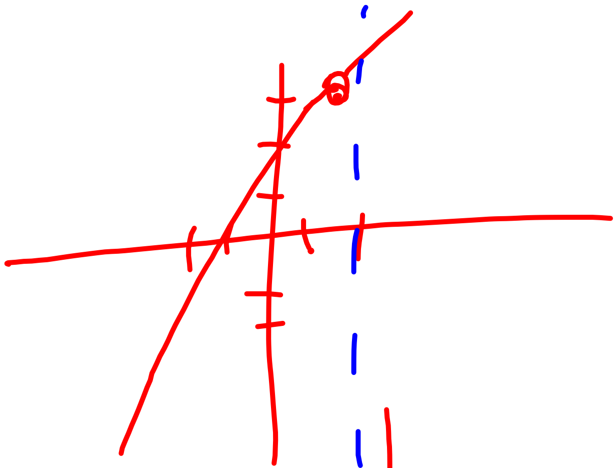
Today's entertainment: pg. 51 #1bdf, 2bdf, 3a, 4a, 5d, 7, 9, 14, 15

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

$$= \frac{\cancel{(x-2)}(x+2)}{\cancel{x-2}}$$

$$= x+2$$

$x \neq 2$



$$y = \frac{1}{x-2}$$

MHF 4UI Unit 1 (Enrichment #3)

Present an organized solution to the following…

Determine all linear functions $f(x) = ax + b$ such that if $g(x) = f^{-1}(x)$ for all values of x, then $f(x) - g(x) = 44$ for all values of x. (Note: f^{-1} is the inverse function of f.)

if $g(x) = f^{-1}(x)$

$y = ax + b$

$x = ay + b$

$\frac{x-b}{a} = y$

$\therefore g(x) = \frac{x-b}{a}$

$f(x) - g(x) = 44$

$f(x) = g(x) + 44$

$= \frac{x-b}{a} + 44$

$= \frac{x}{a} - \frac{b}{a} + \frac{44a}{a}$

$= \frac{1}{a}x + \frac{44a-b}{a}$

When does $ax + b = \frac{1}{a}x + \frac{44a-b}{a}$

$ax = \frac{1}{a}x$

$a = \frac{1}{a}$

if $a = 1$

or $a = -1$

$b = \frac{44a-b}{a}$

$ab = 44a - b$

$b = 44 - b$

$2b = 44$

$b = 22$

$ab = 44a - b$

$(-1)b = 44(-1) - b$

$-b = -44 - b$

$-b + b = -44$

$0 = 44$

Not possible

$\therefore f(x) = 1x + 22$