1-1 Introducing Functions

WHAT ARE THE BASIC PROPERTIES OF FUNCTIONS?

def A relation is a set of ordered pairs

ex $\{(2,5), (3,7), (6,2)\}$

ex

Distance (m)	Time (s)
100	15
200	34
300	60

The domain is the set of all x-values ($\leftrightarrow$ inputs)

The range is the set of all y-values ($\updownarrow$ outputs)

HW: IA #1-3 p.6 #1-4
IB p.7 #1-4

Ex: $\{(1,4),(2,7),(3,10),(4,13)\}$ → set notation

Domain D: $\{1, 2, 3, 4\}$

Range R: $\{4, 7, 10, 13\}$

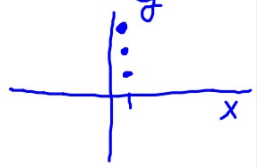
def: A <u>function</u> is a mathematical relationship such that each element of the domain is associated with exactly one element of the range.

Every x has only one y

* x can repeat - only if it goes to the same y
* y can repeat all it wants!

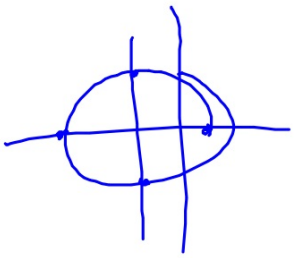
Ex: $\{(1,2),(2,2),(3,2)\}$ <u>is</u> a function

$\{(1,2),(1,3),(1,4)\}$ is <u>not</u>



1B #4

$x^2 + y^2 = 4$

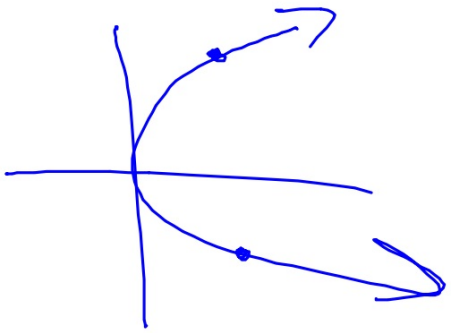


$y^2 = 4 - x^2$

$y = \pm\sqrt{4 - x^2}$

$\sqrt{4} = \pm 2$

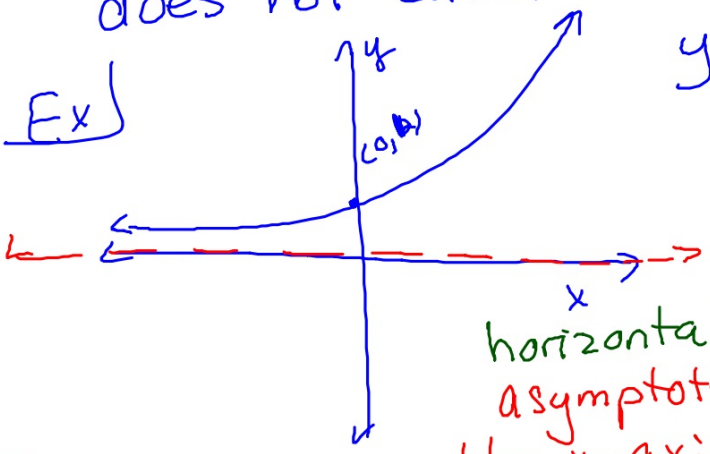
$x^2 = y^2$



Asymptotes

- occurs where the function does not exist

Ex)



$y = 2^x$

if $x = 0$ then $y = 2^0 = 1$

if $x = -1$ then $y = 2^{-1} = \frac{1}{2}$

horizontal asymptote is the x-axis or $y = 0$

* We will never find a value for x that will cause y to be negative

Domain: all Real #s

Range: $y > 0$

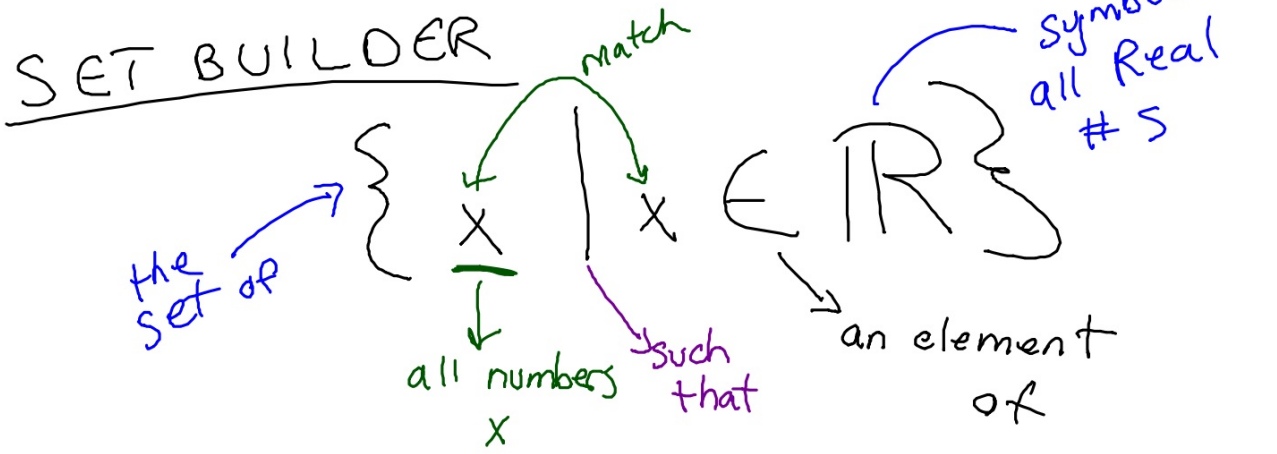
NOTATION

INTERUAL

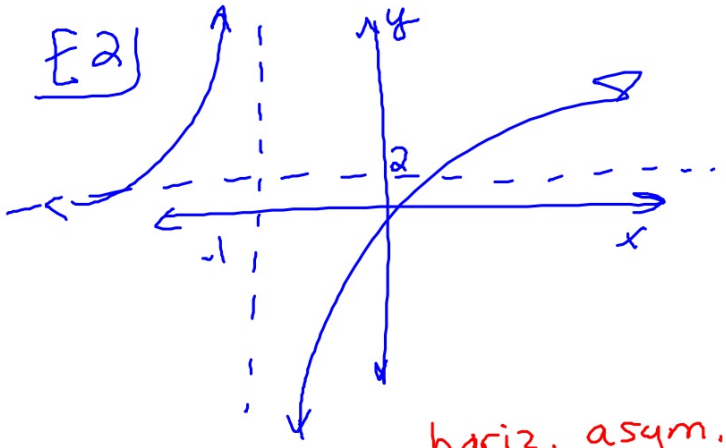
(,) endpoints of an interval are not defined

[,] endpoints are defined

SET BUILDER



Ex 2)



$f(x) = \frac{2x}{x+1}$

rational function

horiz. asym. at $y = 2$

vert. asym. at $x = -1$

Domain: $\{x \mid x \neq -1\}$ $(-\infty, -1) \cup (-1, \infty)$

Range: $\{y \mid y \in \mathbb{R}\}$ $(-\infty, \infty)$

*Note: a function cannot cross a vertical asymptote, but it may cross a horizontal asymptote

Asymptotes occur where a function does not exist:

- can't divide by 0
  - rational functions
- can't take square root of negative #s

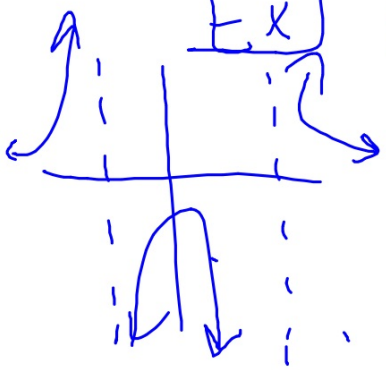
Determining Domain from a function

* ASK: is there anything x cannot be?

Ex) $f(x) = 4x + 1$

no restrictions D: $\{x \mid x \in \mathbb{R}\}$

Ex) $g(x) = \dfrac{x}{x^2 - 2x - 15} = \dfrac{x}{(x+3)(x-5)}$



what makes 0 in denom?

$(x+3)(x-5) = 0$

$x + 3 = 0 \quad x = 5$

$x = -3$

D: $\{x \mid x \neq -3, 5\}$

$(-\infty, -3) \cup (-3, 5) \cup (5, \infty)$

10

p. 12

2

3 b, d, f, h, i

j

1 c

p 10

1-6