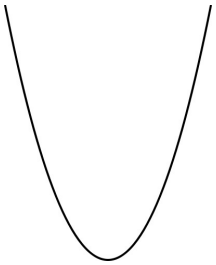
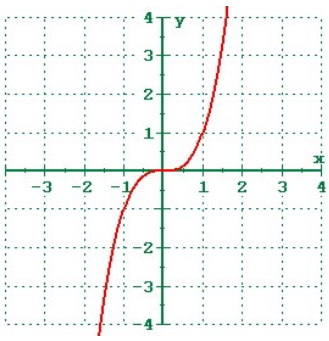
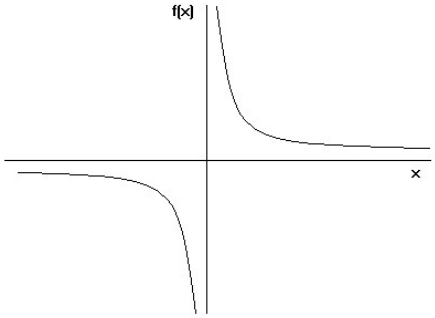
Unit 1: Functions



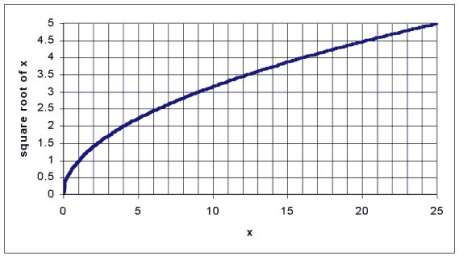
Parabola
$y = x^2$



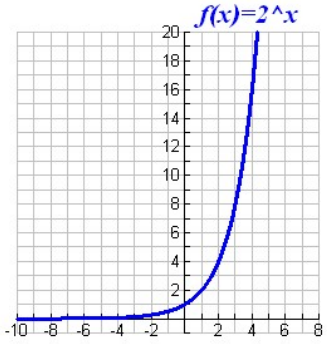
Cubic
$y = x^3$



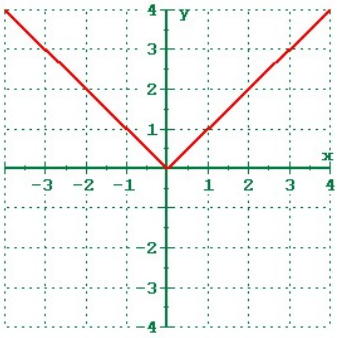
Reciprocal
$y = \frac{1}{x}$



Root
$y = \sqrt{x}$



Exponential
$y = 2^x$



Absolute Value
$y = |x|$

1.1 : Functions, Domain and Range

A. Relation vs. Function

Relation: An identified pattern between two variables

Can be represented as ordered pairs, table of values, graphs, equations

ex. { (-3,4), (-2,1), (-2, 7), (5,-3) } ← Set notation { }

Braces { } are used to represent a set. A set is a collection of items.

Function: A special type of relation in which for every x-value, there is only one corresponding y-value.

*** All functions are relations but not all relations are functions.**

Ex. 1 Which of the following relations are also functions?

a)

x	y
-3	1
-2	4
-1	5

Yes FN

b)

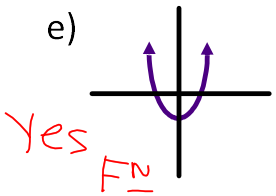
x	y
-2	4
-3	5
-2	7

NO

c) A = {(3,4),(2,-1),(5,-1),(6,4)} Yes FN

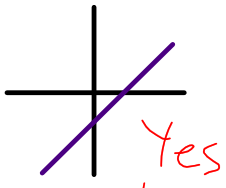
d) B = {(2,2),(3,-4),(2,3),(4,-1)} NO

e)



Yes FN

f)

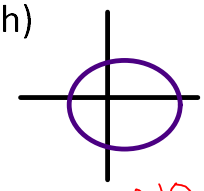


Yes FN

g)

NO

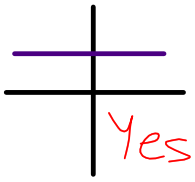
h)



NO

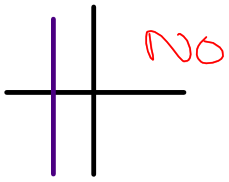
How can we test if a relation is a function?

i)



Yes

j)



NO

The Vertical Line Test

If a relation is graphed, it is a function if a vertical line crosses in no more than one place anywhere on the graph.

B. Domain and Range

Domain: The set of all **input** values (usually "x").
These are the values of x that can be used/make sense.

Range: The set of all **output** values (usually "y").
These are the values of y that are possible given the input.

We use **set notation** to describe the domain and range.
D = { } R = { }

Ex. 2. State the domain and range.

a) {(0,-3),(1,-4),(2,-3),(5,-1),(7,-4)}

$D = \{0, 1, 2, 5, 7\}$

$R = \{-4, -3, -1\}$

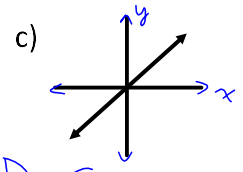
b)

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

$D = \{-3, -2, -1, 0\}$

$R = \{0, 1\}$

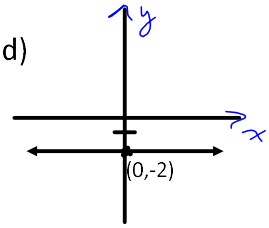
c)



$D = \{x \in \mathbb{R}\}$

$R = \{y \in \mathbb{R}\}$

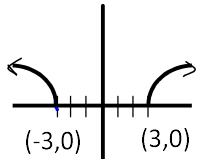
d)



$D = \{x \in \mathbb{R}\}$

$R = \{-2\}$

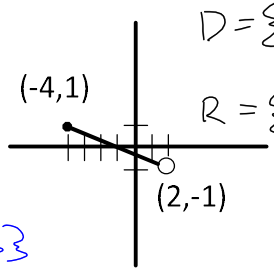
e)



$D = \{x \in \mathbb{R} \mid x \leq -3 \text{ or } x \geq 3\}$

$R = \{y \in \mathbb{R} \mid y \geq 0\}$

f) (-4,1)



$D = \{x \in \mathbb{R} \mid -4 \leq x < 2\}$

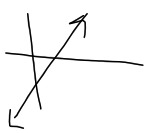
$R = \{y \in \mathbb{R} \mid -1 < y \leq 1\}$

Closed dot: ● Value exists at that point.
Open dot: ○ Value does not exist at that point.

g) $y = 5x - 2$

$D = \{x \in \mathbb{R}\}$

$R = \{y \in \mathbb{R}\}$



h) $y = -4(x - 3)^2 + 2$

Quadratic

Vertex (3, 2)

$D = \{x \in \mathbb{R}\}$

$R = \{y \in \mathbb{R} \mid y \leq 2\}$

i) $x^2 + y^2 = 49$

Circle

$r = \sqrt{49}$

$r = 7$

$D = \{x \in \mathbb{R} \mid -7 \leq x \leq 7\}$

$R = \{y \in \mathbb{R} \mid -7 \leq y \leq 7\}$

`

HOMEWORK

p. 12 # C1, 1,2*, 3abc, 4bc, 5, 6*, 7a, 9ab, 12abcd, 17, 18

*Use Desmos to help sketch the graph (#2,6)