

1-1 Parent Functions

Objectives:

- 1. I can graph the parent functions**
- 2. I can analyze the key features of a graph**

Domain & Range

Domain: x-values - input

read x's from left to right (smallest to largest)

(NOT EXACT [EXACT
*some functions have domain restrictions

can't have a neg. # in a sq. root

to find: set the radicand ≥ 0 and solve for x.

Range: y-values - output

read y's from bottom to top (smallest to largest)

x & y intercepts

y-intercepts: where the graph crosses the y-axis and $x = 0$

x-intercepts: where the graph crosses the x-axis and $y = 0$

intercepts are points on a graph & should be written as **ordered pairs!!!** (x, y)

$$2x + 3y = 6$$

x-intercept ($y = 0$)

$$2x + 3(0) = 6$$

$$2x = 6$$

$$x = 3$$

$(3, 0)$



y-intercept ($x = 0$)

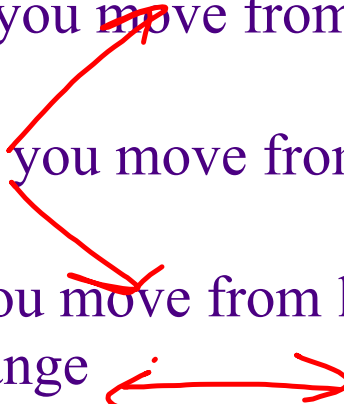
$$2(0) + 3y = 6$$

$$3y = 6$$


$$y = 2$$

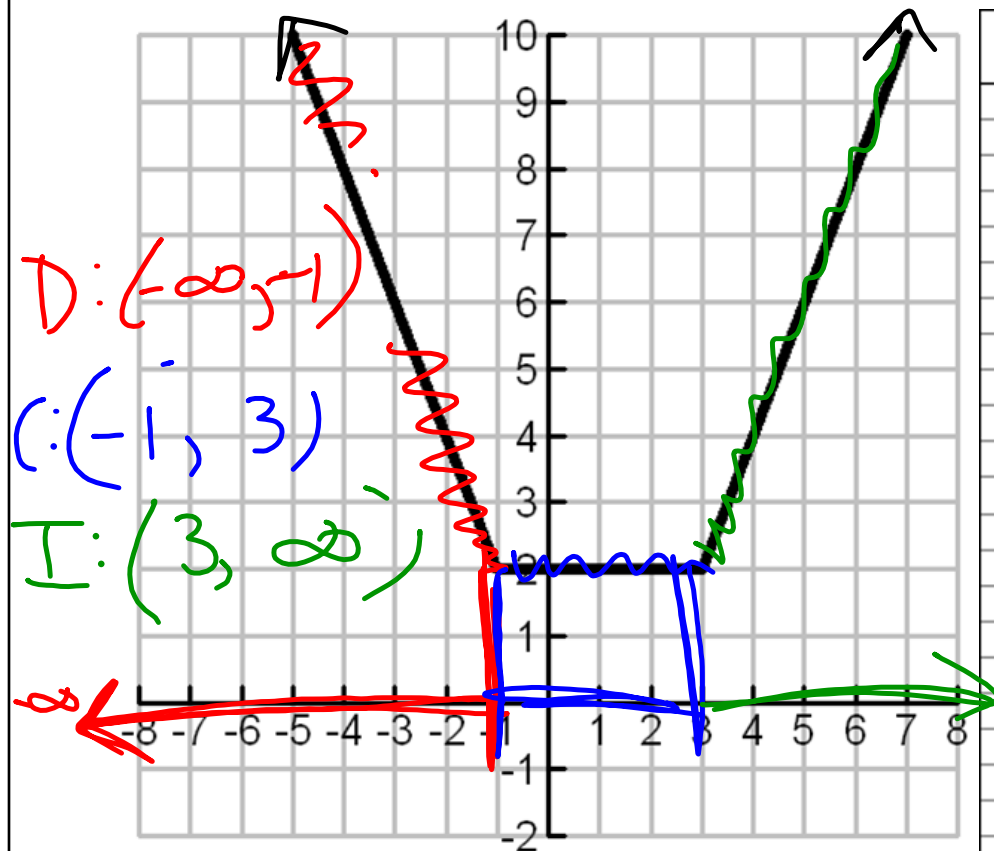
$(0, 2)$

Increasing, Decreasing and Constant

- Increasing: as you ~~move~~ from left to right the y-values increase
 - Decreasing: as you move from left to right the y-values decrease
 - Constant: as you move from left to right the y-values do not change
- 

this behavior is reported using interval notation for the X-VALUES where the graph has a certain behavior

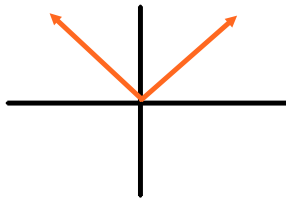




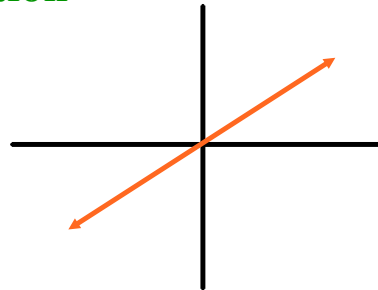
$x:$	$y1(x)$ $\text{abs}(x-3)$
-7	14
-6	12
-5	10
-4	8
-3	6
-2	4
-1	2
0	2
1	2
2	2
3	2
4	4
5	6
6	8
7	10
8	12
9	14
10	16
11	18
12	20
13	22
14	24
15	26
16	28

Symmetry: Even/Odd/Neither/One to One

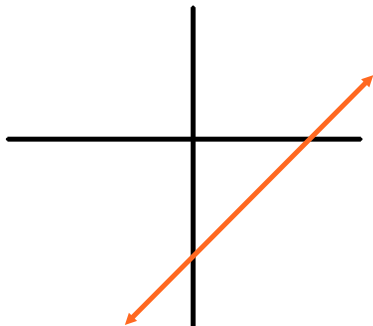
Even: If the graph is symmetric to the y-axis, it is an even function



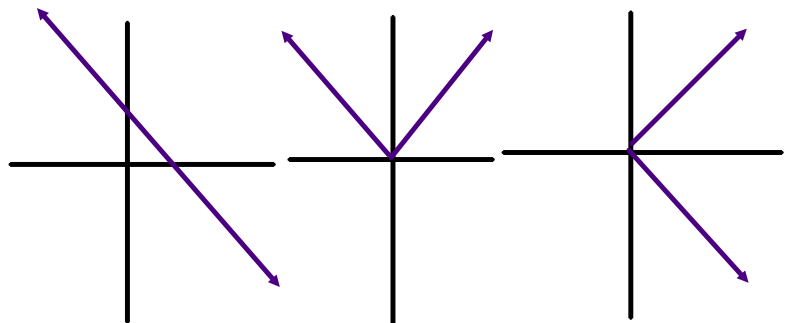
Odd: If the graph is symmetric to the origin, it is an odd function



Neither: If it doesn't fit either odd or even, then it is neither



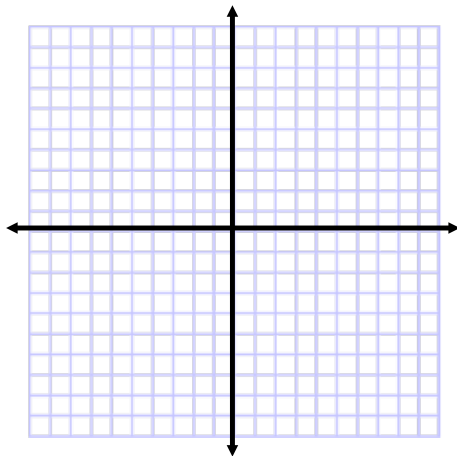
One to one: If a graph passes both the vertical line test and the horizontal line test it is one-to-one



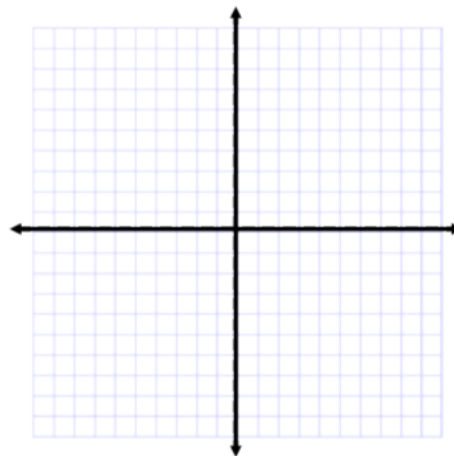
Continuous: A function is continuous if you can draw it in one motion without picking up your pencil.

Discrete: made of ordered pairs or individual parts

Continuous
Function

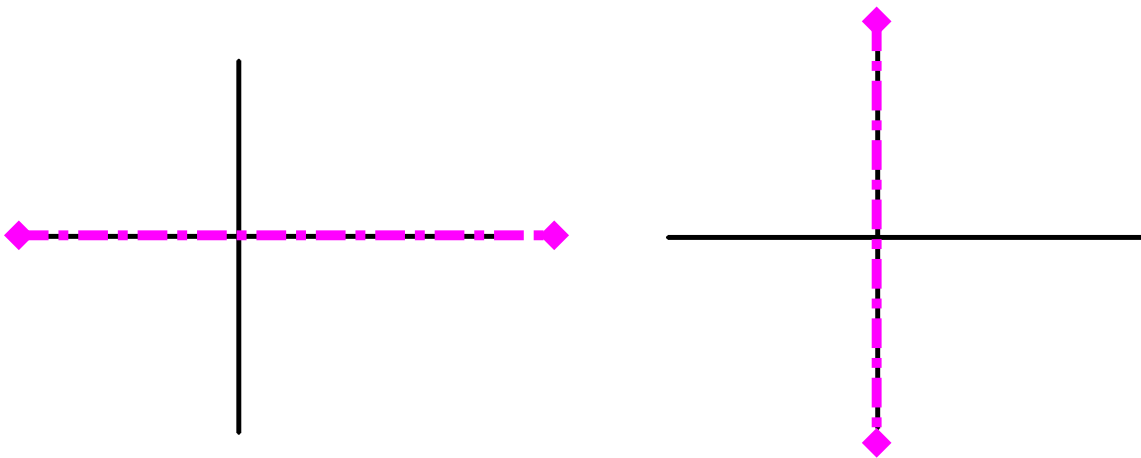


Discrete
Function



Asymptotes

A line that a graph approaches but never touches*



*This is true for vertical asymptotes, we will go into more detail for horizontal asymptotes later

Limits

as x approaches _____, y approaches _____

Describe end behavior using limit notation.

$$\lim_{x \rightarrow \infty} f(x)$$

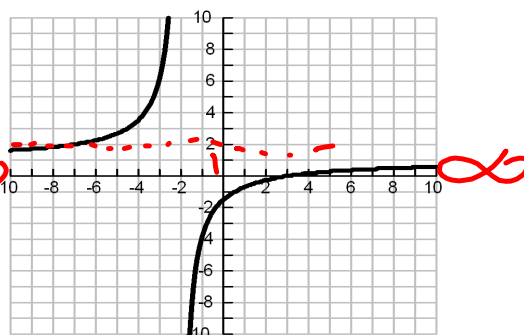
$x \rightarrow \infty$

this means the right

$$\lim_{x \rightarrow -\infty} f(x)$$

$x \rightarrow -\infty$

this means the left end



$$\lim_{x \rightarrow \infty} f(x) = 1$$

$$\lim_{x \rightarrow -\infty} f(x) = 1$$

$$\lim_{x \rightarrow \infty} f(x) = \infty$$

$$\lim_{x \rightarrow -\infty} f(x) = \infty$$

Label Extrema & End behavior

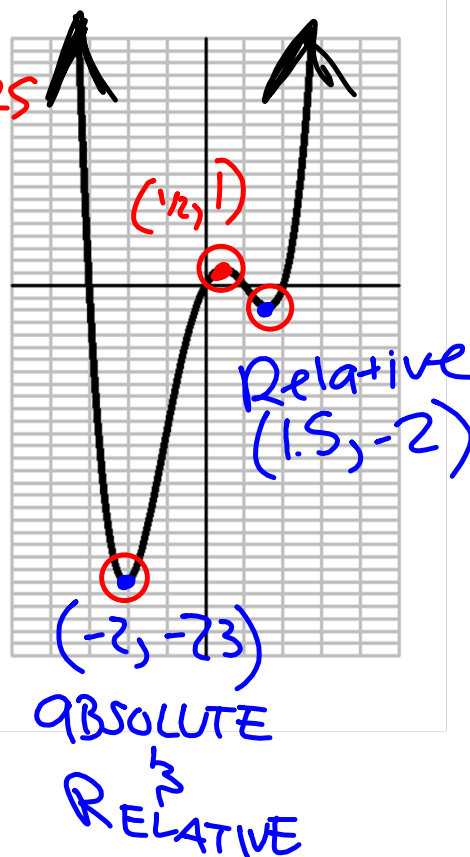
maximums

- relative (local) *higher than others*
- absolute (global) *highest*

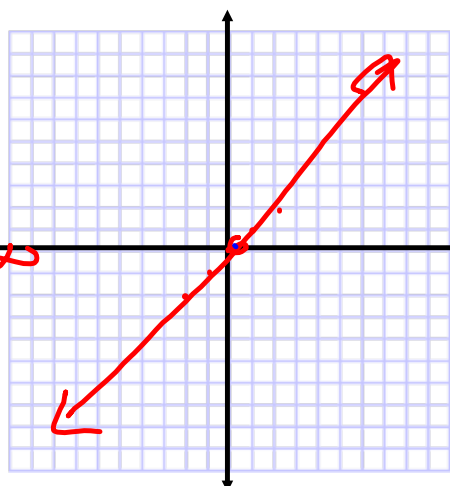
DNE

minimums

- relative (local) *lower than others*
- absolute (global) *lowest*



Linear



Equation: $y = x$

Domain $(-\infty, \infty)$

Range $(-\infty, \infty)$

Increasing $(-\infty, \infty)$

Decreasing DNE

Left End Behavior

Right End Behavior

Odd/Even/Neither

x-intercepts

y-intercepts

Maximum

Minimum

One-to-One

Asymptotes/Discontinuities

$$\lim_{x \rightarrow -\infty} f(x) = -\infty$$

$$\lim_{x \rightarrow \infty} f(x) = \infty$$

$$(0, 0)$$

$$(0, 0)$$

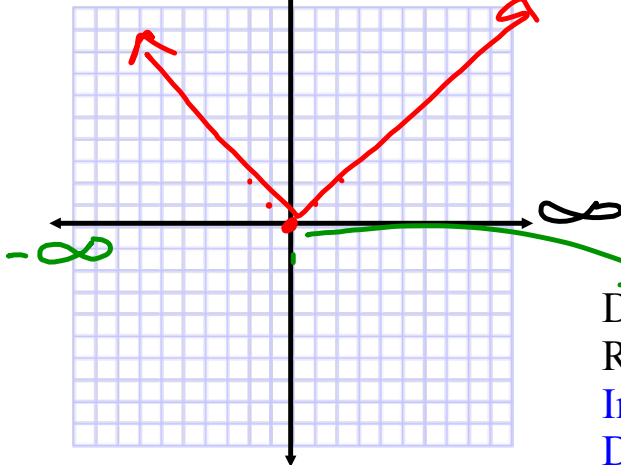
yes

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

Absolute Value

Equation:

$$y = |x|$$



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

Domain

$(-\infty, \infty)$

Range

$[0, \infty)$

Increasing

$(0, \infty)$

Decreasing

$(-\infty, 0)$

Left End Behavior

$$\lim_{x \rightarrow -\infty} f(x) = \infty$$

Right End Behavior

$$\lim_{x \rightarrow \infty} f(x) = \infty$$

Odd/Even/Neither

x-intercepts $(0, 0)$

y-intercepts $(0, 0)$

Maximum DNE

Minimum $(0, 0)$

One-to-One No

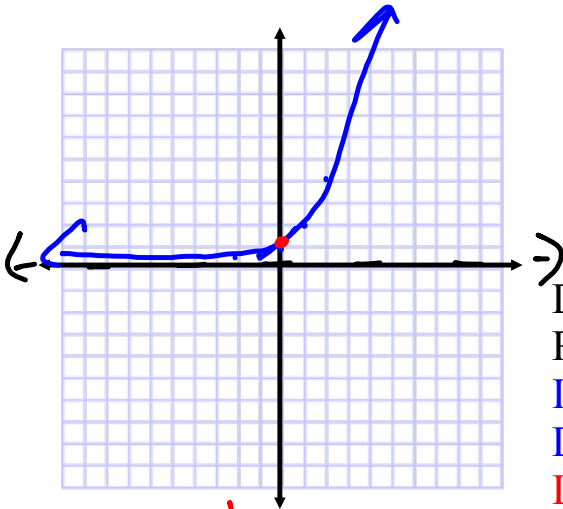
Asymptotes/Discontinuities

No

Exponential

Equation:

$$y = 2^x$$



Domain

 $(-\infty, \infty)$

Range

 $(0, \infty)$

Increasing

 $(-\infty, \infty)$

Decreasing

DNE

Left End Behavior

Right End Behavior

Odd/Even/Neither

x-intercepts

DNE

y-intercepts

 $(0, 1)$

Maximum

DNE

Minimum

DNE

One-to-One

yes

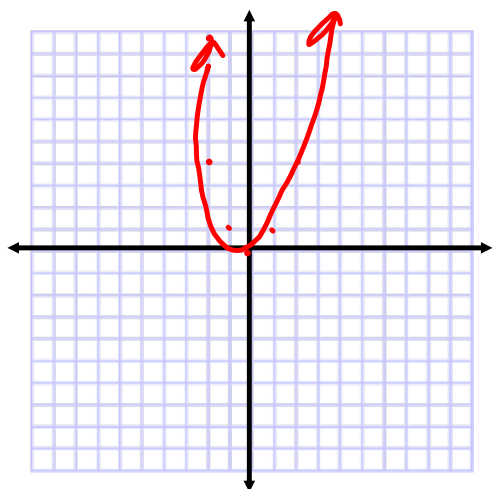
Asymptotes/Discontinuities

 $y = 0$

x	y
-2	$2^{-2} = 1/4$
-1	$2^{-1} = 1/2$
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$

Quadratic

Equation:



$$y = x^2$$

Domain

$$(-\infty, \infty)$$

Range

$$[0, \infty)$$

Increasing

$$(0, \infty)$$

Decreasing

$$(-\infty, 0)$$

Left End Behavior

$$\lim_{x \rightarrow -\infty} f(x) = \infty$$

Right End Behavior

$$\lim_{x \rightarrow \infty} f(x) = \infty$$

Odd/Even/Neither

x-intercepts (0,0)

y-intercepts (0,0)

Maximum

DNE

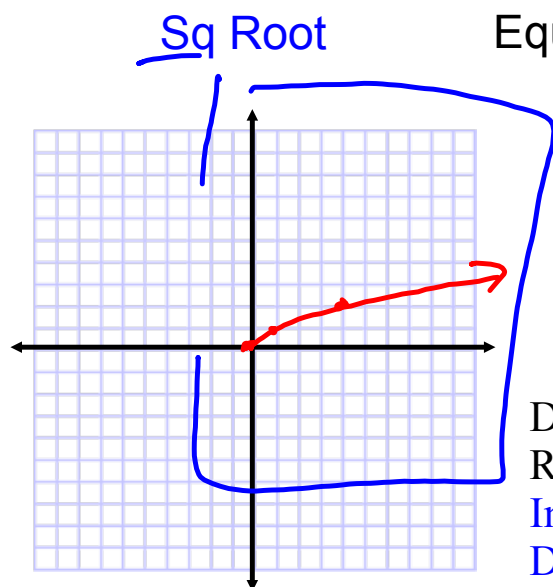
Minimum

(0,0)

One-to-One

Asymptotes/Discontinuities

x	y
-2	$-2^2 = 4$
-1	1
0	0
1	1
2	4



Equation:

$$y = \sqrt{x}$$

Domain

$$[0, \infty)$$

Range

$$[0, \infty)$$

Increasing

$$(0, \infty)$$

Decreasing

DNE

Left End Behavior

$$\lim_{x \rightarrow 0} f(x) = 0$$

Right End Behavior

$$\lim_{x \rightarrow \infty} f(x) = \infty$$

Odd/Even/Neither

$$x \rightarrow \infty$$

x-intercepts

$$(0, 0)$$

y-intercepts

$$(0, 0)$$

Maximum

DNE

Minimum

$$(0, 0)$$

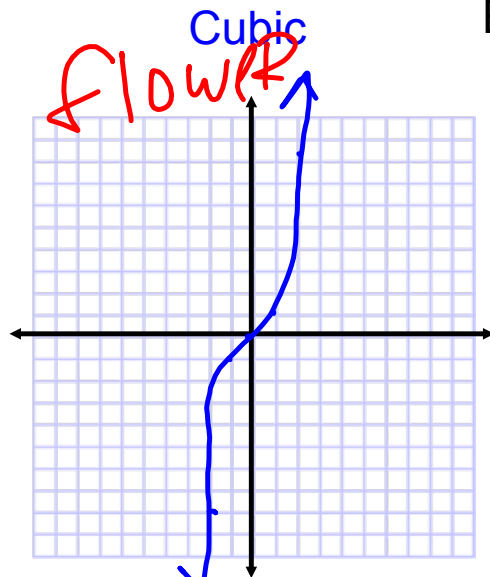
One-to-One

Yes

Asymptotes/Discontinuities

No

x	y
0	0
1	1
4	2



Equation:

$$y = x^3$$

Domain

 $(-\infty, \infty)$

Range

 $(-\infty, \infty)$

Increasing

 $(-\infty, \infty)$

Decreasing

DNE

Left End Behavior

 $\lim_{x \rightarrow -\infty} f(x) = -\infty$

Right End Behavior

 $\lim_{x \rightarrow \infty} f(x) = \infty$

Odd/Even/Neither

x-intercepts $(0, 0)$ y-intercepts $(0, 0)$

Maximum

DNE

Minimum

DNE

One-to-One

Yes

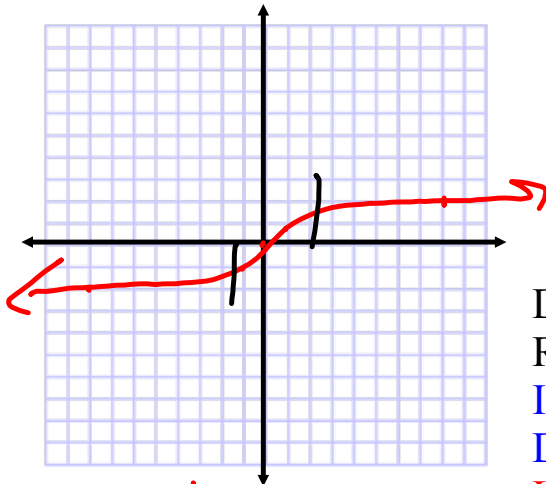
Asymptotes/Discontinuities

No

x	y
-2	$-2 \cdot -2 \cdot -2 = -8$
-1	-1
0	0
1	1
2	8

Cube Root

Equation:



$$y = \sqrt[3]{x}$$

Domain

$$(-\infty, \infty)$$

Range

$$(-\infty, \infty)$$

Increasing

$$(-\infty, \infty)$$

Decreasing

DNE

Left End Behavior

$$\lim_{x \rightarrow -\infty} f(x) = -\infty$$

Right End Behavior

$$\lim_{x \rightarrow \infty} f(x) = \infty$$

Odd/Even/Neither

x-intercepts (0,0)

y-intercepts (0,0)

Maximum

DNE

Minimum

DNE

One-to-One

yes

Asymptotes/Discontinuities

No

X	Y
-8	$\sqrt[3]{-8} = -2$
-1	-1
0	0
1	1
8	2

