1-1 Parent Functions

Objectives:

1. I can graph the parent functions

2. I can analyze the key features of a graph

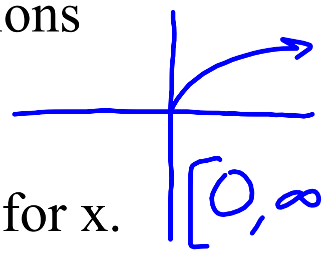
Domain & Range

Domain: x-values - input $(-\infty, \infty)$

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

(Horizontal)

*some functions have domain restrictions



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

to find: set the radicand ≥ 0 and solve for x. $[0, \infty)$

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 $(0, y)$

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

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

$$2x + 3y = 6$$

x-intercept (y = 0)

$2x + 3(0) = 6$

$\frac{2x}{2} = \frac{6}{2}$

$x = 3$

$\boxed{(3, 0)}$

y-intercept (x = 0)

$2(0) + 3y = 6$

$\frac{3y}{3} = \frac{6}{3}$

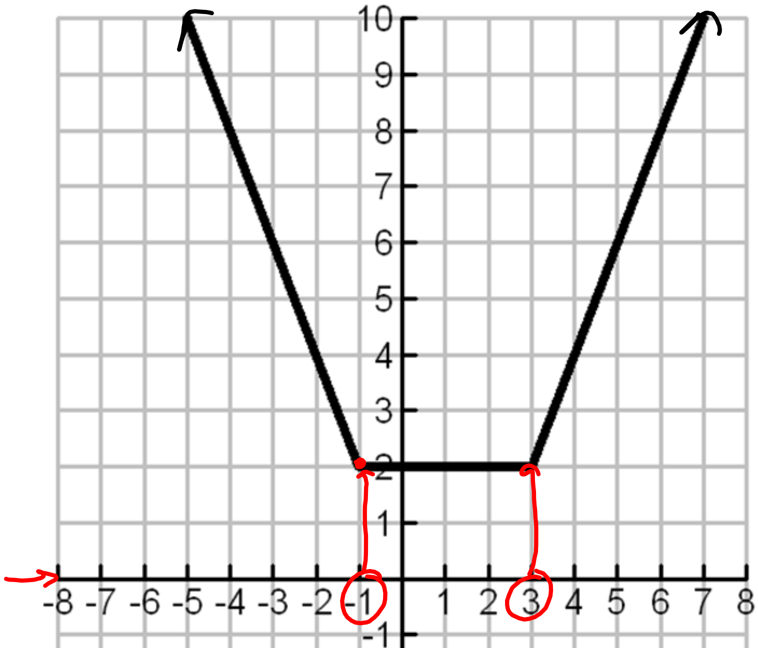
$y = 2$

$\boxed{(0, 2)}$

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

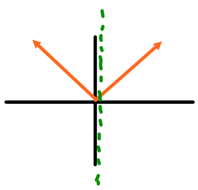


D: $(-\infty,-1)$ C: $(-1,3)$ I: $(3,\infty)$

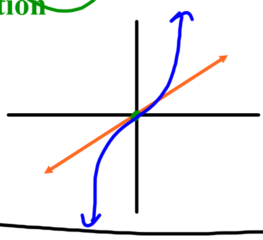
x	y1(x) abs(x-
-7	14
-6	12
-5	10
-4	8
-3	6
-2	4
-1	2
0	2
1	2
2	2
3	2
4	4
5	6
6	8
7	10
8	12
9	14
10	16
11	18
12	20
13	22
14	24
15	26
16	28

Symmetry: Even/Odd/Neither/One to One

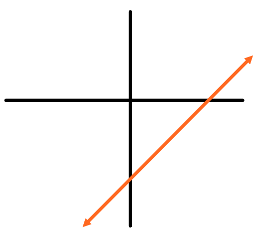
Even: If the graph is symmetric to the y-axis, it is an even function



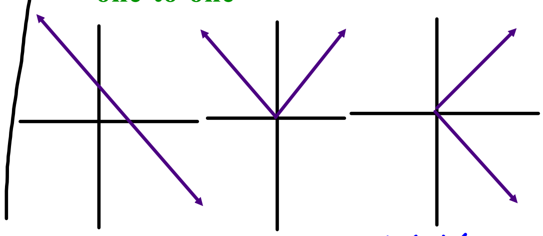
Odd: If the graph is symmetric to the origin, it is an odd function



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



V: ✓ H: ✓ ☺

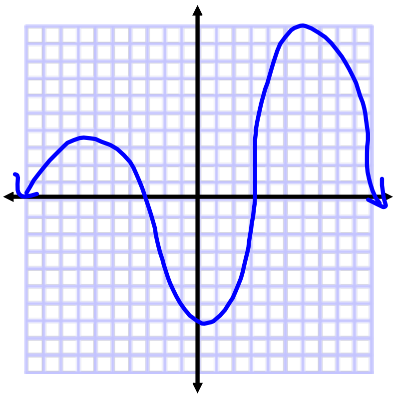
V: ✓ H: X ☹

V: X H: ✓ ☹

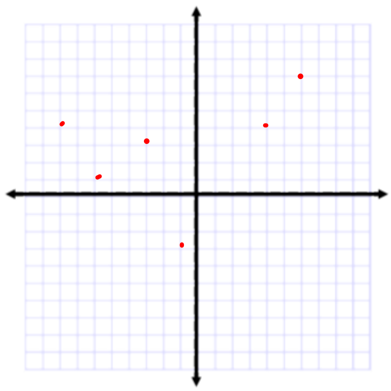
Continuous: A function is continuous if you can draw it in one motion without picking up your pencil.

Discrete: made of ordered pairs or individual parts

Continuous Function (pass V. line test)

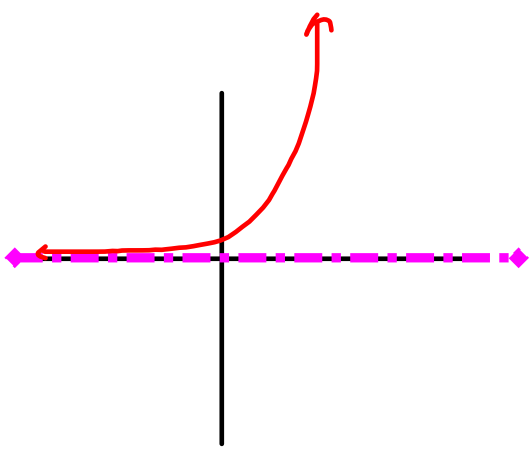


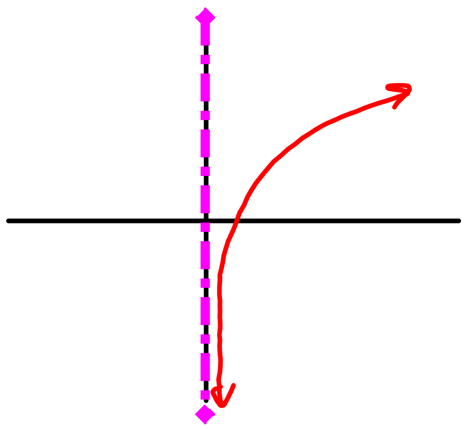
Discrete Function



Asymptotes

A line that a graph approaches but never touches*



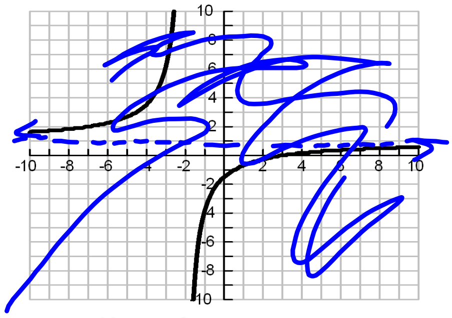


*This is true for vertical asymptotes, we will go into more detail for horizontal asymptotes later

Limits

as x approaches ________, y approaches ___________

Describe end behavior using limit notation:



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

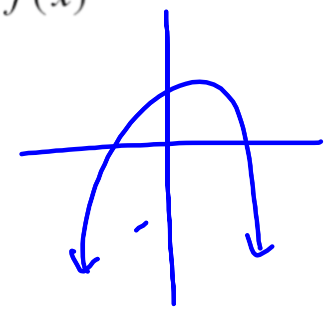
this means the right

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

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

this means the left end

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



Label Extrema & End behavior

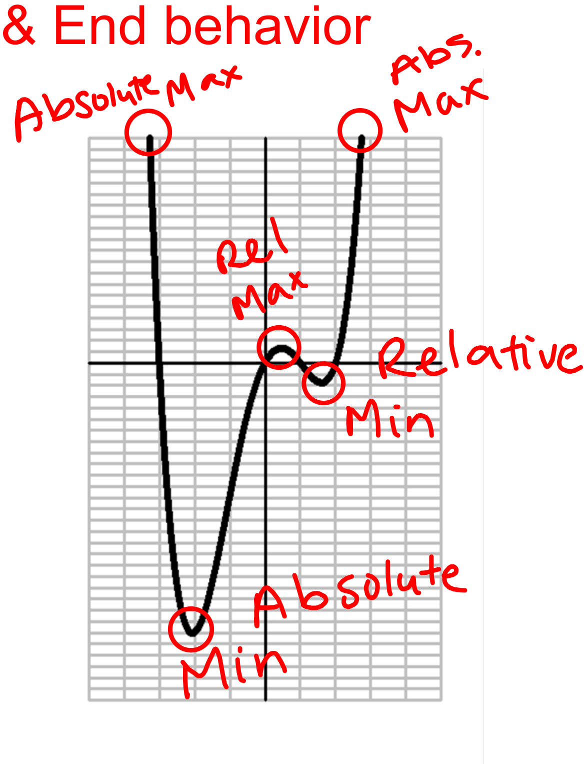
maximums

- relative (local)
- absolute (global)

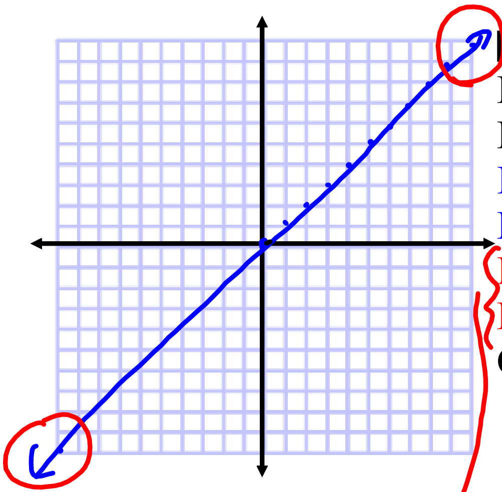
minimums

- relative (local)
- absolute (global)

Must be points
(x,y)



Linear

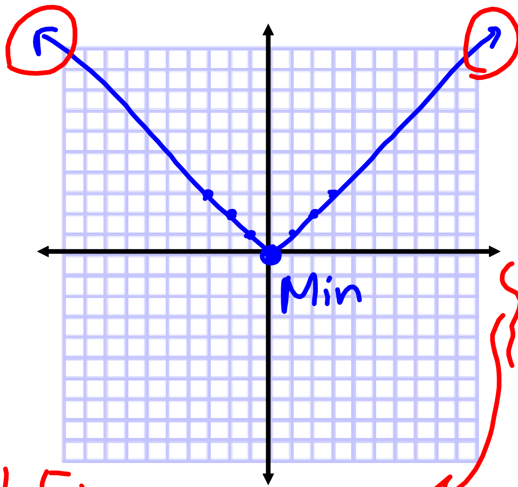


Equation: $f(x) = x$
Domain $(-\infty, \infty)$
Range $(-\infty, \infty)$
Increasing $(-\infty, \infty)$
Decreasing None
Left End Behavior
Right End Behavior
Odd/Even/Neither (symm) Odd
x-intercepts $(0,0)$
y-intercepts $(0,0)$
Maximum None
Minimum None
One-to-One Yes
Asymptotes/Discontinuities None

L.E:
$\lim_{x \to -\infty} f(x) = -\infty$

R.E.
$\lim_{x \to \infty} f(x) = +\infty$

Absolute Value

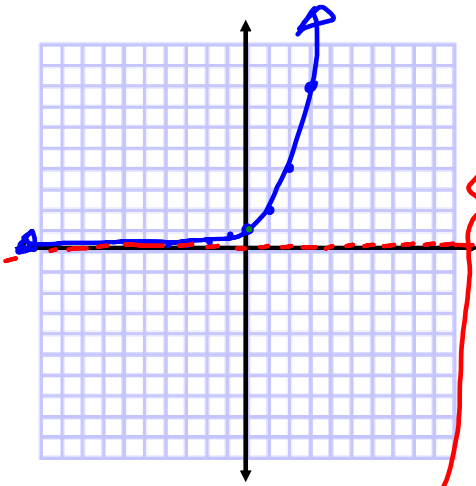


Equation: $f(x) = |x|$
Domain $(-\infty, \infty)$
Range $[0, \infty)$
Increasing $(0, \infty)$
Decreasing $(-\infty, 0)$
Left End Behavior
Right End Behavior
Odd/Even/Neither Even
x-intercepts $(0,0)$
y-intercepts $(0,0)$
Maximum None
Minimum $(0,0)$
One-to-One No
Asymptotes/Discontinuities No

LE:
$\lim_{x \to -\infty} f(x) = +\infty$

RE:
$\lim_{x \to \infty} f(x) = +\infty$

Exponential



Equation: $f(x) = 2^x$

Domain $(-\infty, \infty)$

Range $(0, \infty)$

Increasing $(-\infty, \infty)$

Decreasing None

Left End Behavior

Right End Behavior

Odd/Even/Neither

x-intercepts None

y-intercepts $(0, 1)$

Maximum None

Minimum None

One-to-One Yes

Asymptotes/Discontinuities

$\hookrightarrow y = 0$

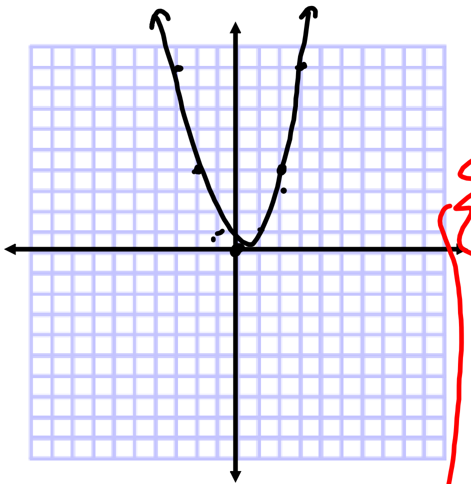
LE:

$\lim_{x \to -\infty} f(x) = 0$

RE

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

Quadratic



Equation: $f(x) = x^2$

Domain $(-\infty, \infty)$

Range $[0, \infty)$

Increasing $(0, \infty)$

Decreasing $(-\infty, 0)$

Left End Behavior

Right End Behavior

Odd/Even/Neither

x-intercepts $(0, 0)$

y-intercepts $(0, 0)$

Maximum None

Minimum $(0, 0)$

One-to-One No

~~Asymptotes/Discontinuities~~

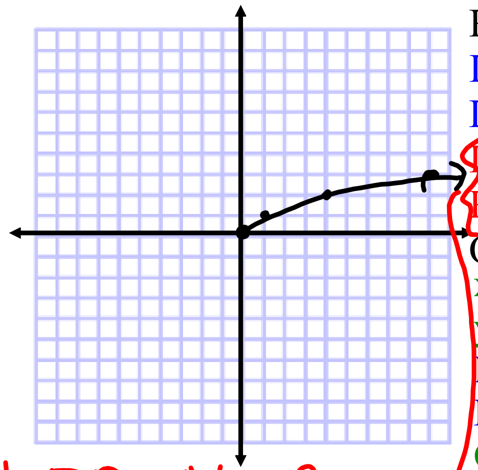
L.E.B.:

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

REB:

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

Sq Root



Equation: $f(x)=\sqrt{x}$

Domain $[0,\infty)$

Range $[0,\infty)$

Increasing $(0,\infty)$

Decreasing Never

Left End Behavior

Right End Behavior

Odd/Even/Neither

x-intercepts $(0,0)$

y-intercepts $(0,0)$

Maximum None

Minimum $(0,0)$

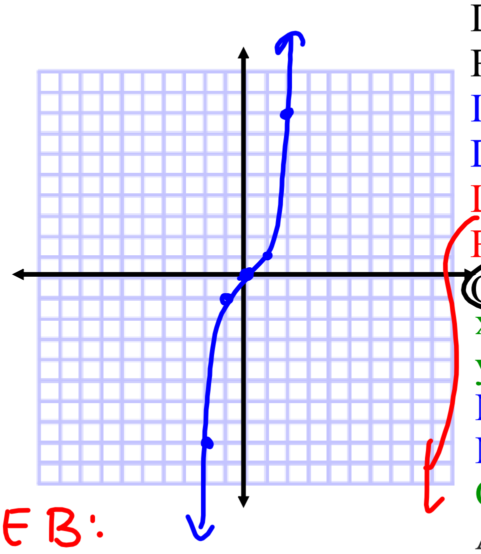
One-to-One Yes

Asymptotes/Discontinuities

LEB: None (No arrow)

REB: $\lim_{x\to\infty} f(x)=\infty$

Cubic



Equation: $f(x)=x^3$

Domain $(-\infty,\infty)$

Range $(-\infty,\infty)$

Increasing $(-\infty,\infty)$

Decreasing Never

Left End Behavior

Right End Behavior

Odd/Even/Neither

x-intercepts $(0,0)$

y-intercepts $(0,0)$

Maximum None

Minimum None

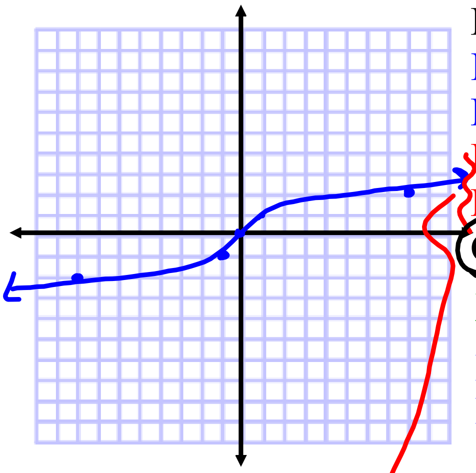
One-to-One Yes

Asymptotes/Discontinuities

LEB: $\lim_{x\to-\infty} f(x)=-\infty$

REB: $\lim_{x\to\infty} f(x)=\infty$

Cube Root



Equation: $f(x) = \sqrt[3]{x}$

Domain $(-\infty, \infty)$

Range $(-\infty, \infty)$

Increasing $(-\infty, \infty)$

Decreasing Never

Left End Behavior

Right End Behavior

Odd/Even/Neither

x-intercepts $(0,0)$

y-intercepts $(0,0)$

Maximum NONE

Minimum

One-to-One Yes

Asymptotes/Discontinuities

LEB:

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

REB:

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