

1-1 Parent Functions

Objectives:

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

Domain & Range

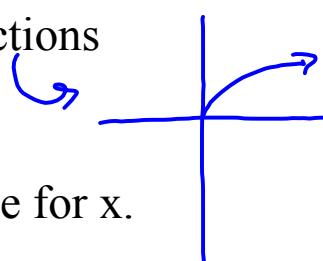
Domain: x-values - input

read x's from left to right (smallest to largest)
 $(-\infty, \infty)$

*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)
($,$) = open (not touching those $\#$'s)

[$,$] = closed (touches that $\#$)

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 ($y = 0$)

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

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

$$x = 3$$

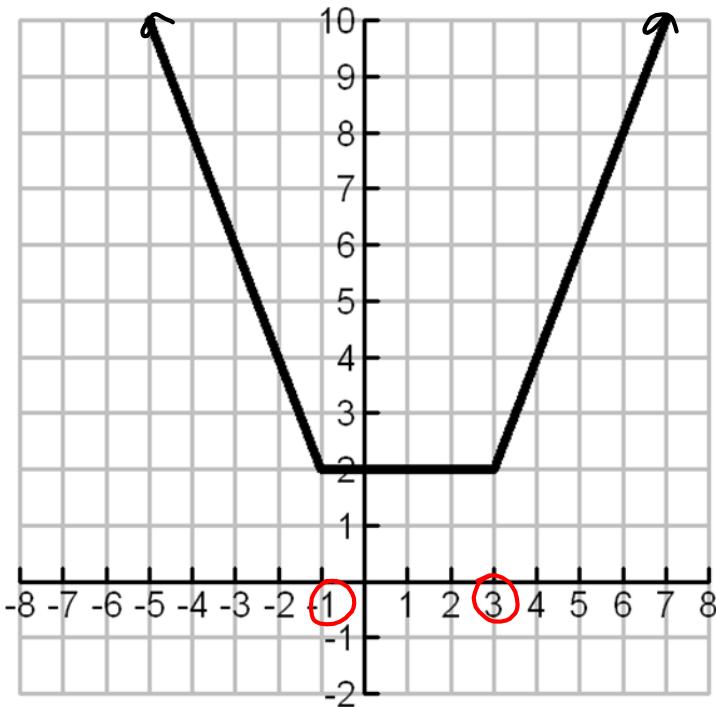
$$(3, 0)$$

y-intercept ($x = 0$)

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

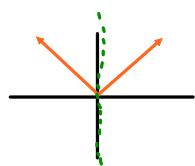


D: $(-\infty, -1)$ C: $(-1, 3)$ I: $(3, \infty)$

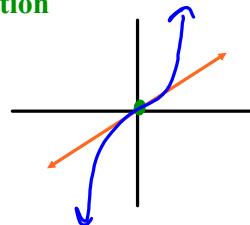
x	y ₁ (x) abs(x - 3)
-7	14
-6	12
-5	10
-4	8
-3	6
-2	4
-1	2
0	2
1	2
2	2
3	2
4	4
5	6
6	8
7	10
8	12
9	14
10	16
11	18
12	20
13	22
14	24
15	26
16	28

Symmetry: Even/Odd/Neither/One to One

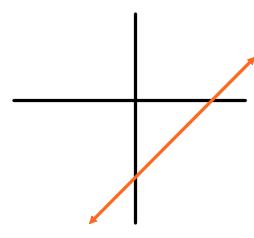
Even: If the graph is symmetric to the y-axis, it is an even function



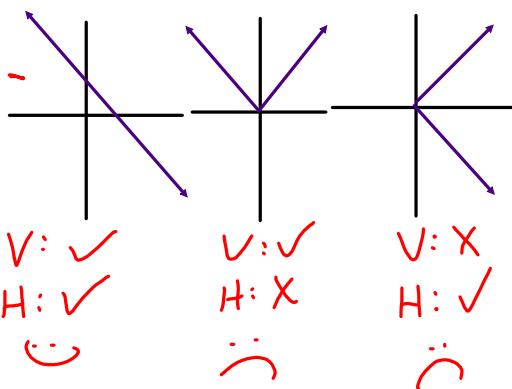
Odd: If the graph is symmetric to the origin , it is an odd function



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



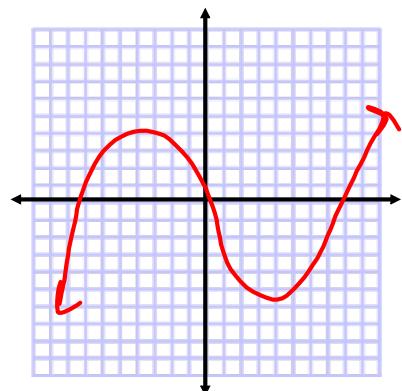
One to one: If a graph passes both the vertical line test and the horizontal line test it is one-to-one



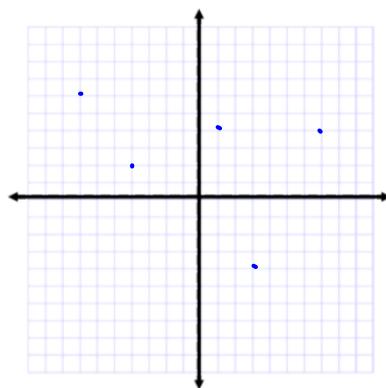
Continuous: A function is continuous if you can draw it in one motion without picking up your pencil.

Discrete: made of ordered pairs or individual parts

Continuous
Function

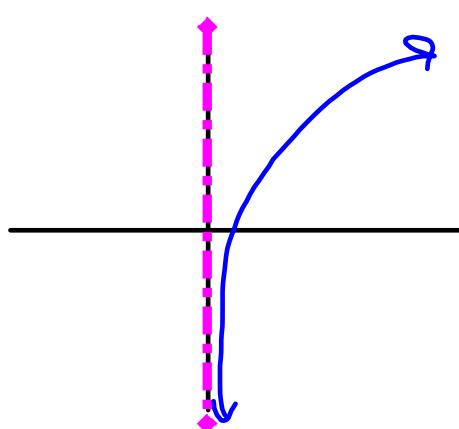
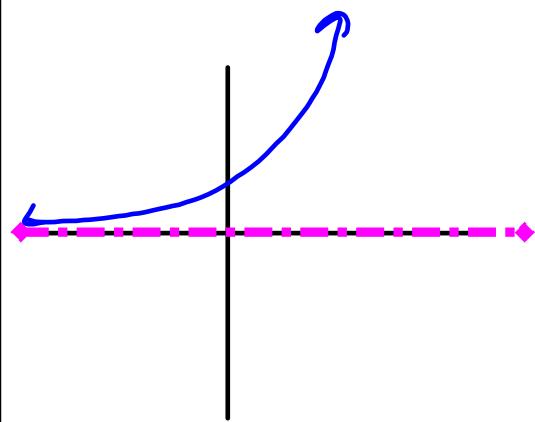


Discrete
Function



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

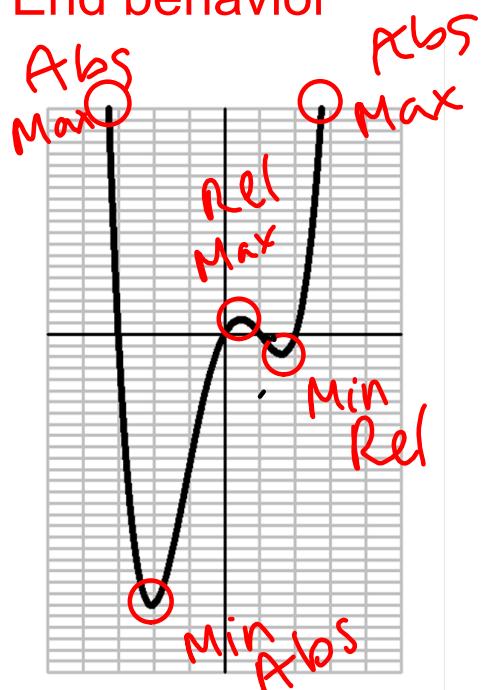
Label Extrema & End behavior

maximums

- relative (local)
- absolute (global)

minimums

- relative (local)
- absolute (global)



Limits

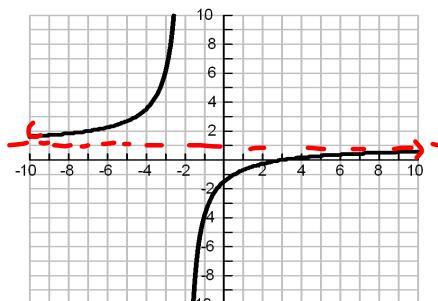
as x approaches _____, y approaches _____

Describe end behavior using limit notation:

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

up / down
+∞ / -∞

this means the right

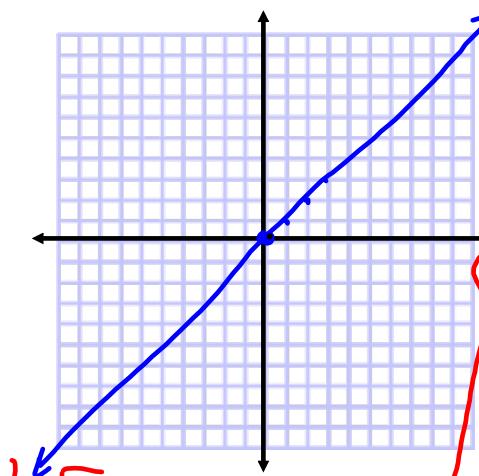


$$\lim_{x \rightarrow -\infty} f(x) =$$

this means the left end

$$\lim_{x \rightarrow \infty} f(x) = 1$$
$$\lim_{x \rightarrow -\infty} f(x) = 0$$

Linear



LE:

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

RE:

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

Equation: $f(x) = x$

Domain $(-\infty, \infty)$

Range $(-\infty, \infty)$

Increasing $(-\infty, \infty)$

Decreasing Never

Left End Behavior

Right End Behavior

Odd/Even/Neither (Sym) Odd

x-intercepts $(0, 0)$

y-intercepts $(0, 0)$

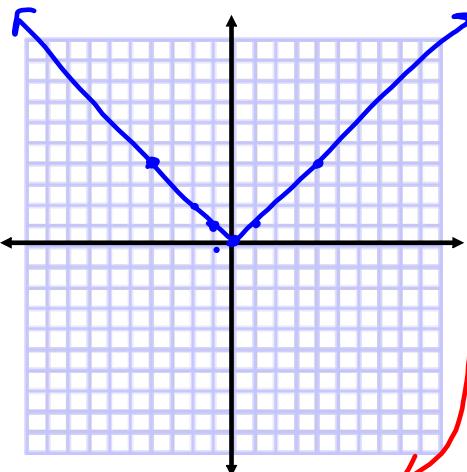
Maximum None

Minimum None

One-to-One Yes

Asymptotes/Discontinuities \times

Absolute Value



LE: ↑

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

RE: ↑

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

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

x-intercepts $(0, 0)$

y-intercepts $(0, 0)$

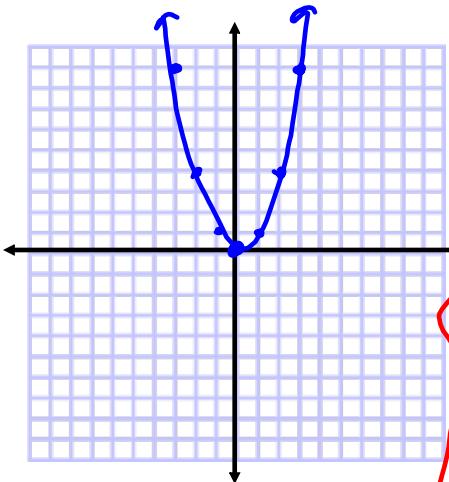
Maximum None

Minimum $(0, 0)$

One-to-One No

Asymptotes/Discontinuities \times

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

y-intercepts

Maximum

Minimum

One-to-One

Asymptotes/Discontinuities

$\{0, 0\}$

$\{0, 0\}$

None

$(0, 0)$

No

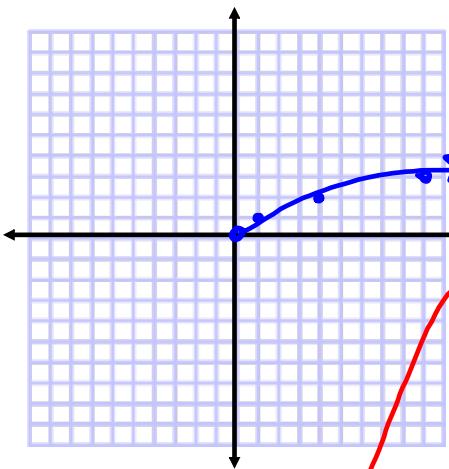
LE:

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

RE:

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

Sq Root



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

Domain $[0, \infty)$

Range $[0, \infty)$

Increasing $(0, \infty)$

Decreasing Never

Left End Behavior

None!

Right End Behavior

Odd/Even Neither

x-intercepts

y-intercepts

Maximum

Minimum

One-to-One

Asymptotes/Discontinuities

$(0, 0)$

$(0, 0)$

None

$(0, 0)$

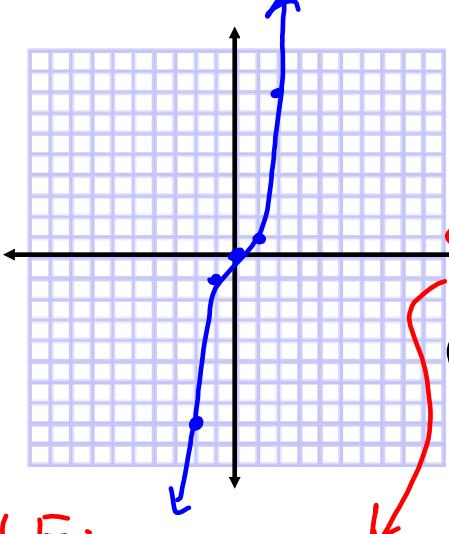
Yes

No \sqrt of Negatives!

RE: T

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

Cubic



(E:

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

RE:

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

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**

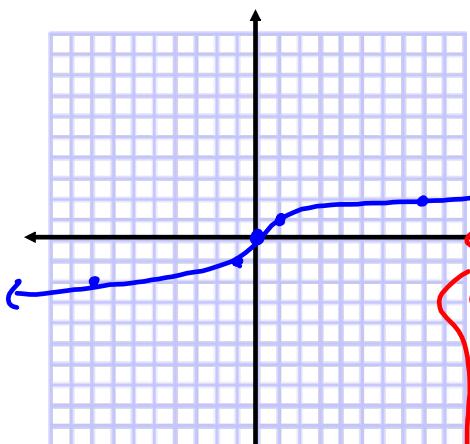
Minimum **None**

One-to-One

Yes

Asymptotes/Discontinuities **X**

Cube Root



Can take $\sqrt[3]{}$ of
Negative #'s !

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

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

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**

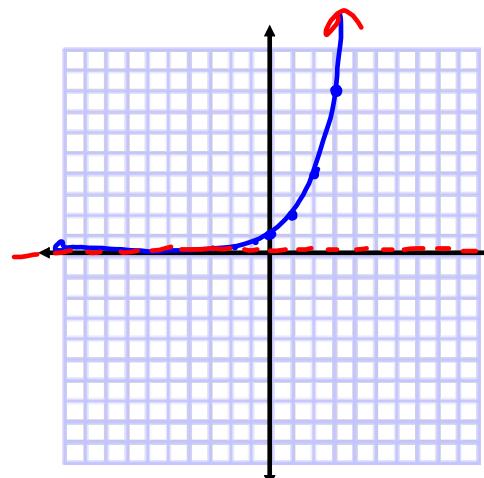
Minimum **None**

One-to-One

Yes

Asymptotes/Discontinuities **X**

Exponential



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

Domain $(-\infty, \infty)$

Range $(0, \infty)$

Increasing $(-\infty, \infty)$

Decreasing **Never**

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

$$y=0$$

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

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