

1-1 Parent Functions and Attributes

Objectives:

- I can identify the shape and attributes of the following parent functions:

- Linear
- Absolute Value
- Exponential
- Quadratic
- Square Root
- Cubic
- Cube Root

Domain and Range

Domain: Set of all input values *x-values*

Domain restrictions come from input values that result in:

- the square root of a negative number
- dividing by zero
- the log of a non positive number

Range: Set of all output values *y-values*

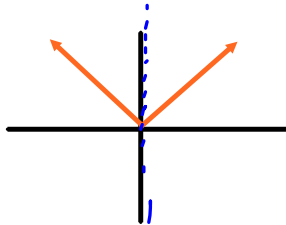
Increasing, Decreasing and Constant

- 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

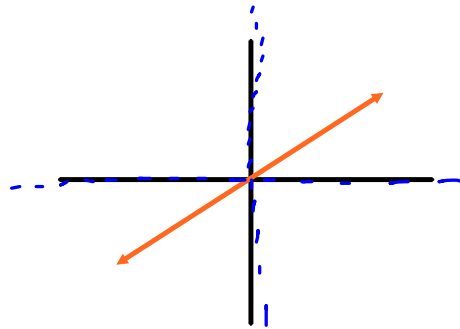
this behavior is reported using interval notation for the X-VALUES where the graph has a certain behavior

Symmetry: Even/Odd/Neither

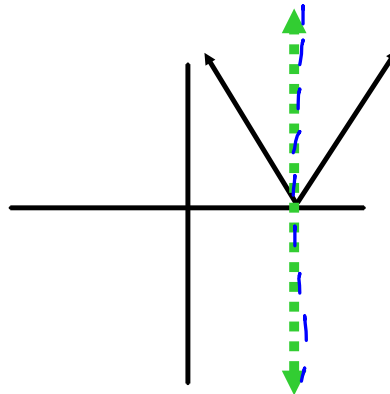
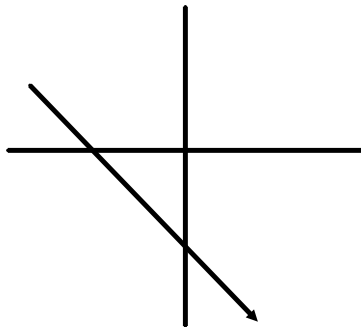
Even Function: If the graph is symmetric to the y-axis



Odd Function: If the graph is symmetric to the origin



Neither: Symmetry can still exist but the function is neither even or odd



Limits

as x approaches _____, y approaches _____

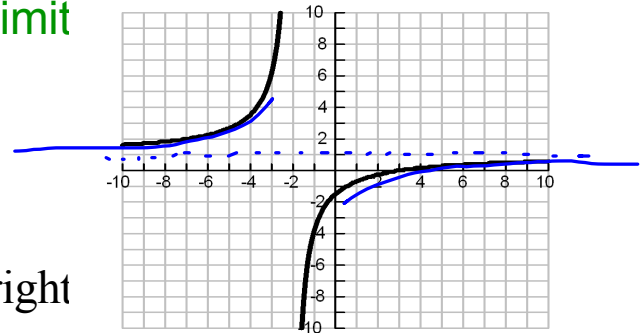
Describe end behavior using limit notation:

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

this means the right

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

this means the left end



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

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

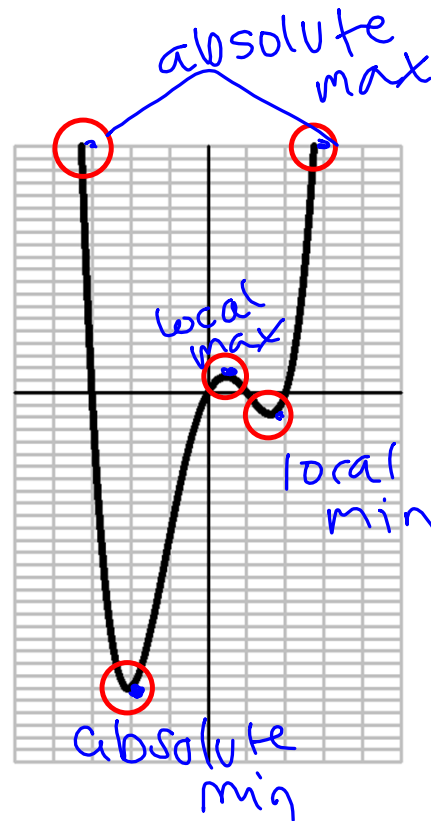
Label Extrema & End Behavior

maximums

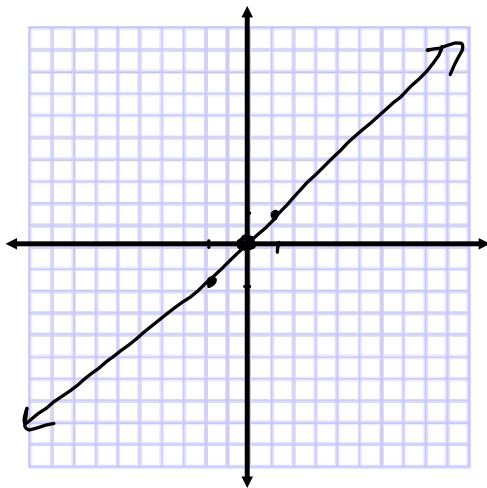
- local (relative)
- absolute (global)

minimums

- local (relative)
- absolute (global)



Linear



Equation: $f(x) = x$

Domain $(-\infty, \infty)$

Range $(-\infty, \infty)$

Increasing $(-\infty, \infty)$

Decreasing n/a

Left End Behavior

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

Right End Behavior

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

Symmetry: odd

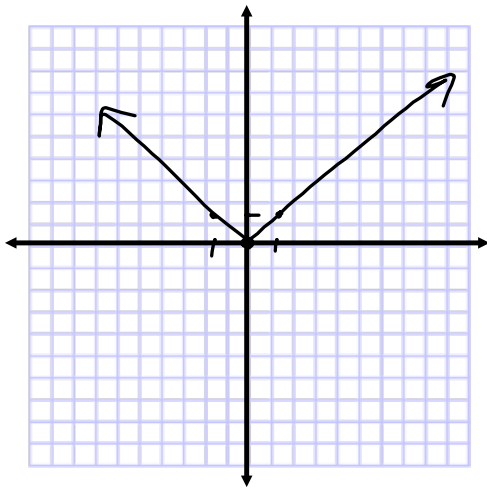
x-intercept(s) $(0, 0)$

y-intercept(s) $(0, 0)$

Maximum

Minimum N/A

Absolute Value



Equation: $f(x) = |x|$

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

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

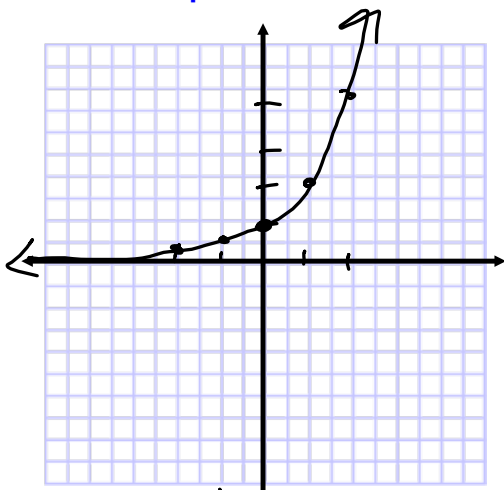
Symmetry: even

x-intercept(s) $(0, 0)$ y-intercept(s) $(0, 0)$ Maximum n/a Minimum 0

$$y = 0$$

$$(0, 0)$$

Exponential



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

Domain $(-\infty, \infty)$
 Range $(0, \infty)$
 Increasing $(-\infty, \infty)$
 Decreasing n/a

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

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

Symmetry: neither

x-intercept(s) n/a

y-intercept(s) $(0, 1)$

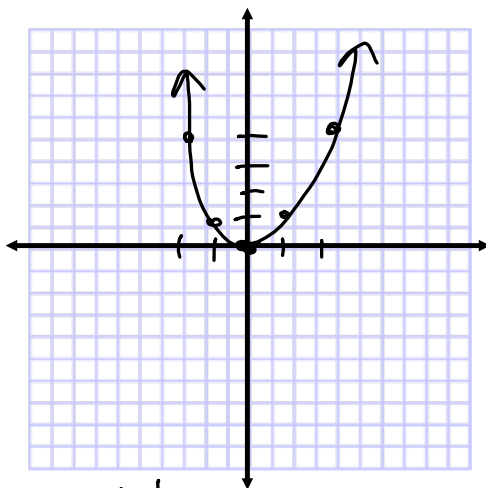
Maximum N/A

Minimum N/A

| x | y |
|----|-----|
| -2 | 1/4 |
| -1 | 1/2 |
| 0 | 1 |
| 1 | 2 |
| 2 | 4 |

$2^{-2} = \frac{1}{2^2}$
 $2^{-1} = \frac{1}{2}$
 $2^0 = 1$
 $2^1 = 2$
 $2^2 = 4$

Quadratic



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

Domain

Range

Increasing

Decreasing

Left End Behavior

Right End Behavior

Symmetry:

x-intercept(s)

y-intercept(s)

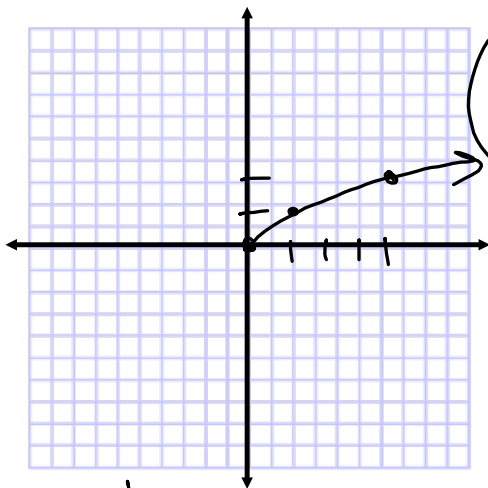
Maximum

Minimum

Same as
abs
value

| X | Y |
|----|---|
| -2 | 4 |
| -1 | 1 |
| 0 | 0 |
| 1 | 1 |
| 2 | 4 |

Sq Root



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

Domain $[0, \infty)$

(Restrictions)

Range $[0, \infty)$

Increasing $(0, \infty)$

Decreasing n/a

Left End Behavior

Right End Behavior

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

Symmetry: n/a

x-intercept(s) $(0, 0)$

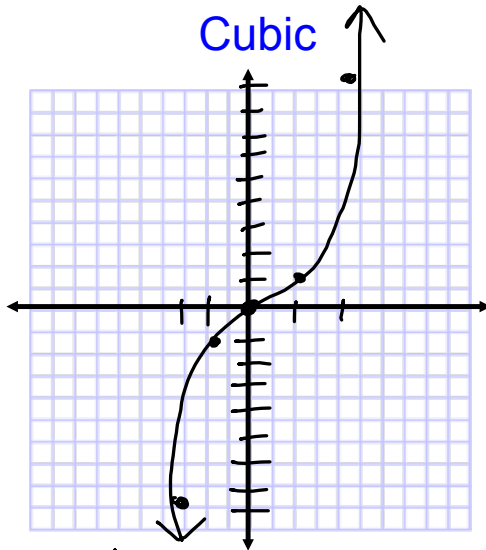
y-intercept(s) $(0, 0)$

Maximum n/a

Minimum $y = 0$
 $(0, 0)$

| x | y |
|---|---|
| 0 | 0 |
| 1 | 1 |
| 4 | 2 |

Cubic



| x | y |
|----|----|
| -2 | -8 |
| -1 | -1 |
| 0 | 0 |
| 1 | 1 |
| 2 | 8 |

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

Domain $(-\infty, \infty)$

Range $(-\infty, \infty)$

Increasing $(-\infty, \infty)$

Decreasing n/a

Left End Behavior

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

Right End Behavior

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

Symmetry: odd

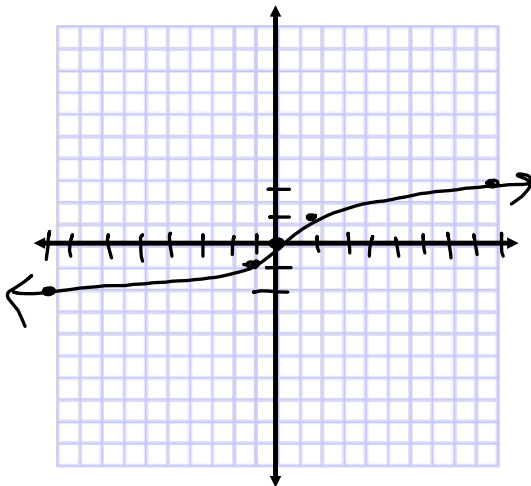
x-intercept(s) $(0, 0)$

y-intercept(s) $(0, 0)$

Maximum

Minimum N/A

Cube Root



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

Domain

Range

Increasing

Decreasing

Left End Behavior

Right End Behavior

Symmetry:

x-intercept(s)

y-intercept(s)

Maximum

Minimum

same
as
cubic

| x | y |
|----|----|
| -8 | -2 |
| -1 | -1 |
| 0 | 0 |
| 1 | 1 |
| 8 | 2 |