3.6A One-to-one Functions

▼ Definition of One-to-One Function

A function f is **one-to-one** if for any values $a \neq b$ in the domain of f, $f(a) \neq f(b)$.

▼ Examples to determine if a set of order pairs represent a one-to-one function

▼ Example 1:

$\{(1,10),(2,10),(3,10)\}$

▼ Example 2:

$\{(2,3),(1,9),(-2,8),(5,2)\}$

▼ Example 3:

$\{(-2,3),(5,6),(-2,1),(3,8)\}$

▼ The Horizontal Line Test

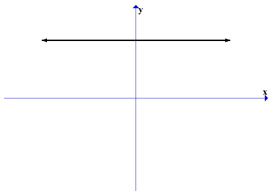
If every horizontal line intersects the graph of a function f at most once, then f is one-to-one.

▼ Examples

▼ Basic Functions

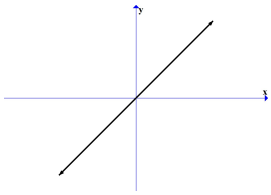
Constant:

$$f(x) = c$$



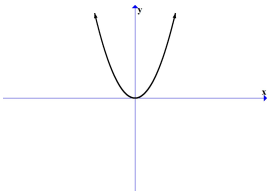
Identity:

$$f(x) = x$$



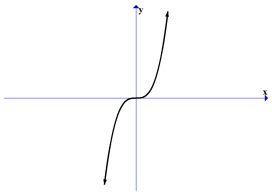
Square:

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



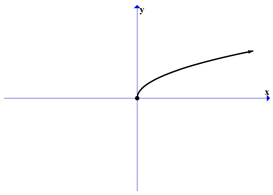
Cube:

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



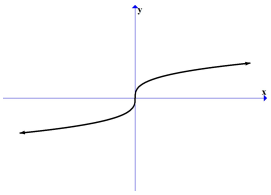
Square Root:

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



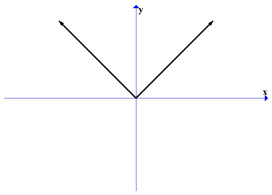
Cube Root:

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



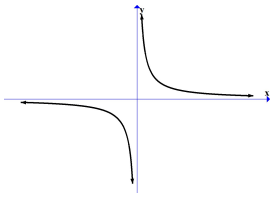
Absolute Value:

$$f(x) = |x|$$



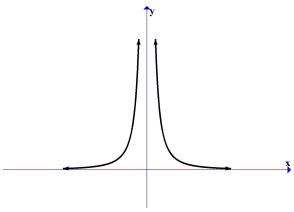
Reciprocal:

$$f(x) = \frac{1}{x}$$



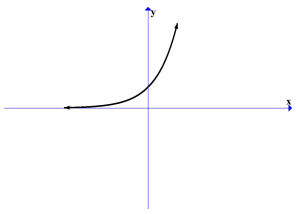
Reciprocal Squared:

$$f(x) = \frac{1}{x^2}$$



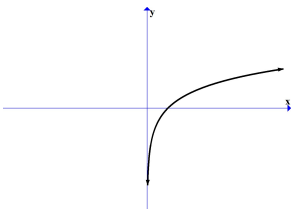
Exponential Base e:

$$f(x) = e^x$$



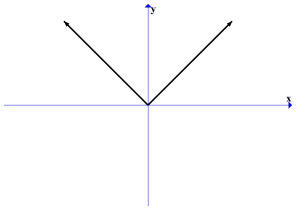
Logarithmic Base e:

$$f(x) = \ln x$$



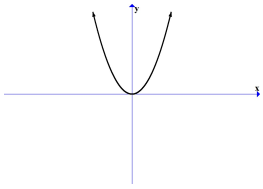
▼ Restricting the Domain

▼ Absolute Value:



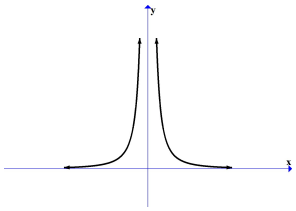
$f(x) = |x|$

▼ Square:



$f(x) = x^2$

▼ Reciprocal Squared:



$f(x) = \frac{1}{x^2}$

▼ Piecewise Defined Functions

▼ Example 1:

$$f(x) = \begin{cases} x + 5 & x < 2 \\ -x - 3 & x \geq 2 \end{cases}$$

▼ Example 2:

$$f(x) = \begin{cases} x^2 & x \leq 0 \\ -x - 5 & x > 0 \end{cases}$$