

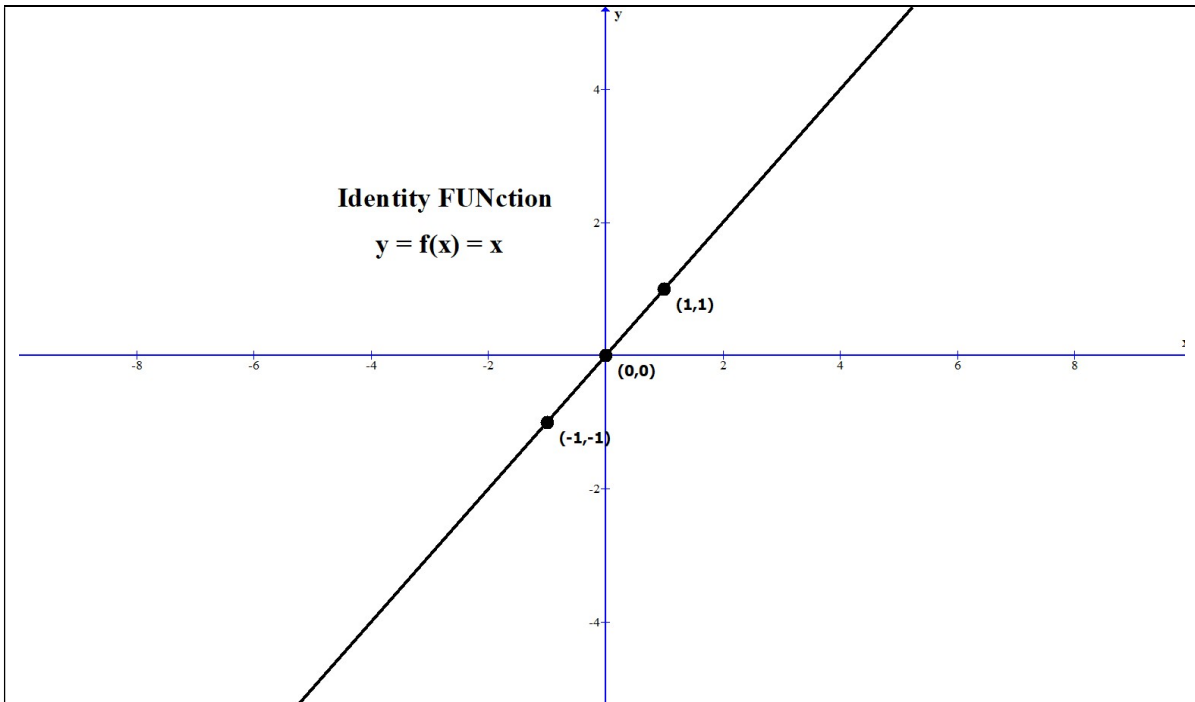
# **FUNctions - Basic Graphs**

**[Identity, Square, Cube, Absolute Value, ...]**

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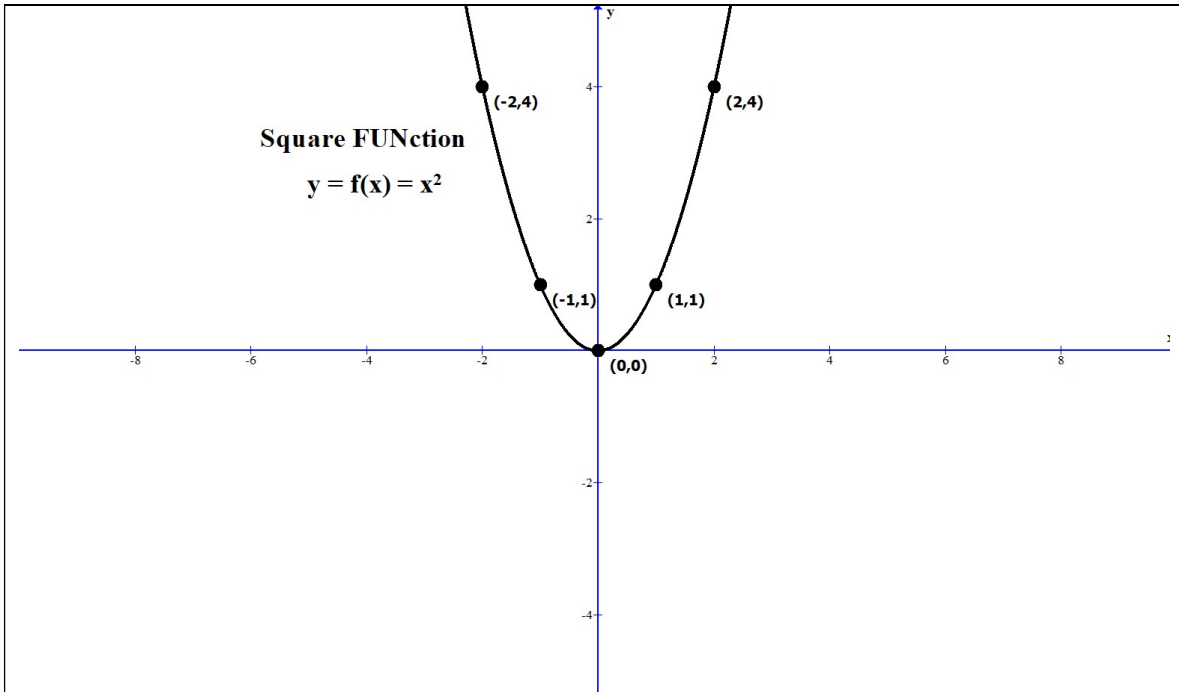
Just as bricks are used to construct various structures, there are Basic FUNctions that are used to form complicated functions which describe real-world phenomenon. The following Basic FUNctions, together with their properties and graphs, are just a few of them.

# Identity FUNCTION: $y = f(x) = x$



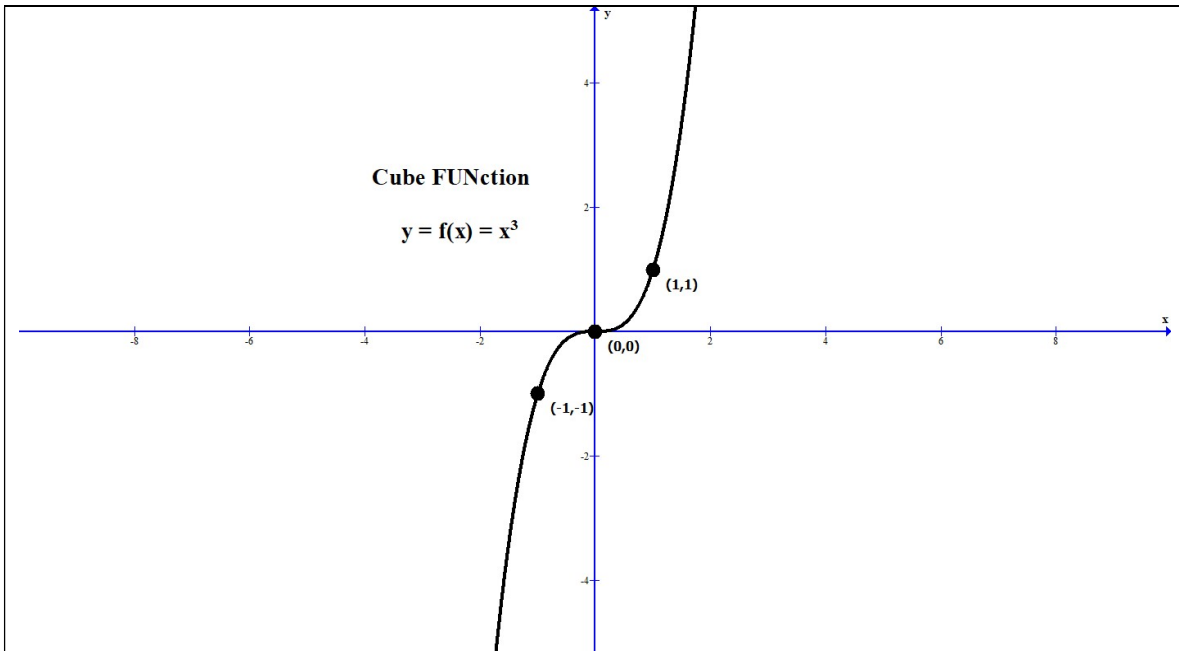
1. **Domain:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points:** y: (0,0) ; x: (0,0)
3. **Continuity:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
  - a.  $x \rightarrow -\infty \Rightarrow f(x) \rightarrow -\infty$
  - b.  $x \rightarrow +\infty \Rightarrow f(x) \rightarrow +\infty$
5. **Odd/Even:** Odd
6. **Inc f:**  $(-\infty, +\infty)_x$  ; **Dec f:** N/A
7. **Rel Max/Min Pt:** N/A
8. **CU f:** N/A ; **CD f:** N/A
9. **Inf Pt:** N/A
10. **Graph:** Above
11. **Abs Max/Min Pt:** N/A
12. **Range:**  $\mathbb{R}_y = (-\infty, +\infty)_y$

## Square FUNCTION: $y = f(x) = x^2$



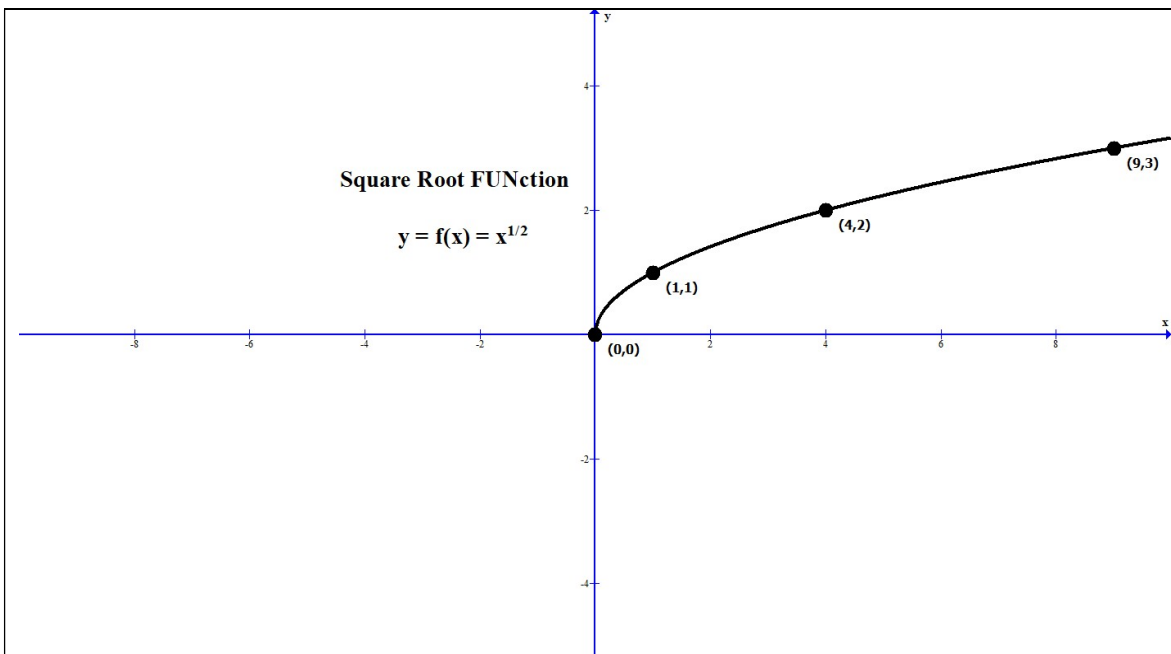
1. **Domain:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points:**  $y: (0,0)$ ;  $x: (0,0)$
3. **Continuity:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
  - a.  $x \rightarrow -\infty \Rightarrow f(x) \rightarrow +\infty$
  - b.  $x \rightarrow +\infty \Rightarrow f(x) \rightarrow +\infty$
5. **Odd/Even:** Even
6. **Inc f:**  $[0, +\infty)_x$ ; **Dec f:**  $(-\infty, 0]_x$
7. **Rel Max Pt:** N/A; **Rel Min Pt:**  $(0,0)$
8. **CU f:**  $(-\infty, +\infty)_x$ ; **CD f:** N/A
9. **Inf Pt:** N/A
10. **Graph:** Above
11. **Abs Max Pt:** N/A; **Abs Min Pt:**  $(0,0)$
12. **Range:**  $[0, +\infty)_y$

# Cube FUNCTION: $y = f(x) = x^3$



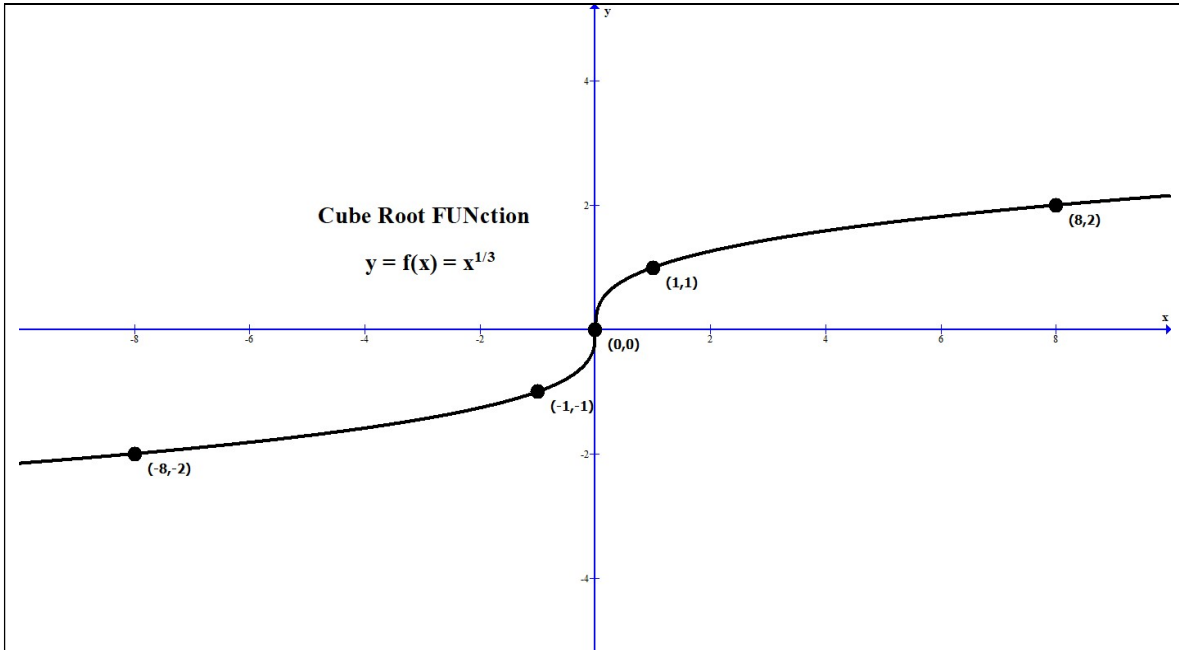
1. **Domain:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points:** y:  $(0,0)$  ; x:  $(0,0)$
3. **Continuity:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
  - a.  $x \rightarrow -\infty \Rightarrow f(x) \rightarrow -\infty$
  - b.  $x \rightarrow +\infty \Rightarrow f(x) \rightarrow +\infty$
5. **Odd/Even:** Odd
6. **Inc f:**  $(-\infty, +\infty)_x$  ; **Dec f:** N/A
7. **Rel Max Pt:** N/A ; **Rel Min Pt:** N/A
8. **CU f:**  $[0, +\infty)_x$  ; **CD f:**  $(-\infty, 0]_x$
9. **Inf Pt:**  $(0,0)$
10. **Graph:** Above
11. **Abs Max Pt:** N/A ; **Abs Min Pt:** N/A
12. **Range:**  $(-\infty, +\infty)_y$

## Square Root FUNCTION: $y = f(x) = \sqrt[2]{x} = \sqrt{x} = x^{1/2}$



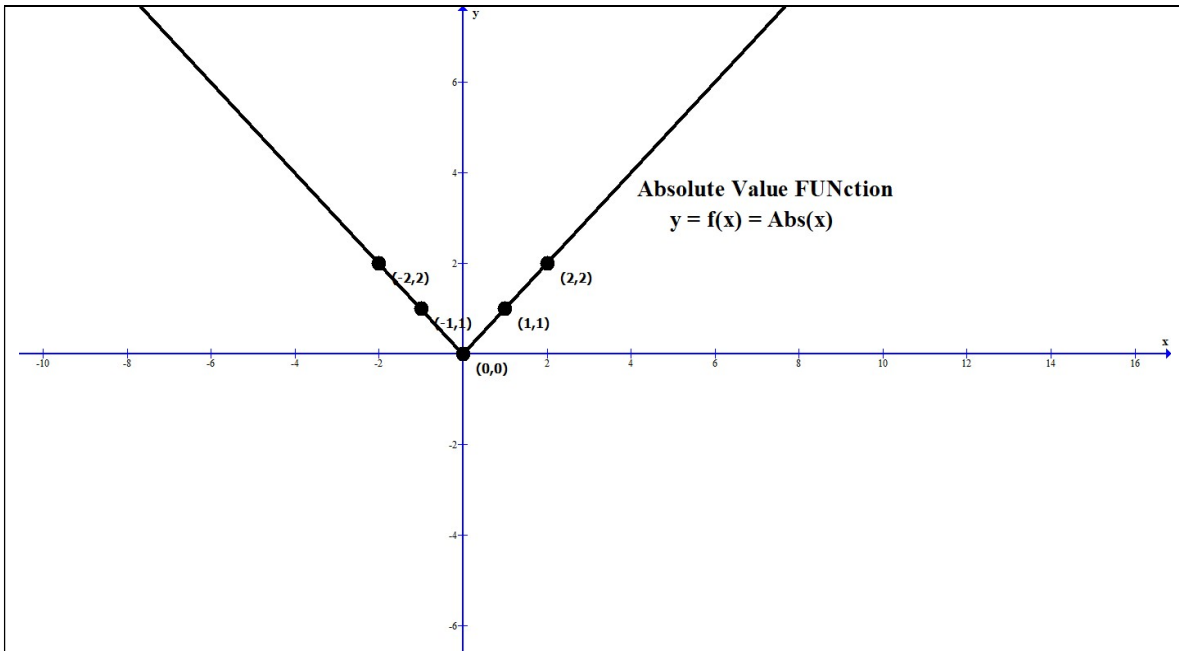
1. **Domain:**  $[0, +\infty)_x$
2. **Intercept Points:** y:  $(0,0)$  ; x:  $(0,0)$
3. **Continuity:**  $[0, +\infty)_x$
4. **Behavior at Infinity:**
  - a.  $x \rightarrow -\infty \Rightarrow f(x) \rightarrow \text{N/A}$
  - b.  $x \rightarrow +\infty \Rightarrow f(x) \rightarrow +\infty$  ... slowly
5. **Odd/Even:** Neither
6. **Inc f:**  $[0, +\infty)_x$  ; **Dec f:** N/A
7. **Rel Max Pt:** N/A ; **Rel Min Pt:**  $(0,0)$
8. **CU f:** N/A ; **CD f:**  $[0, +\infty)_x$
9. **Inf Pt:** N/A
10. **Graph:** Above
11. **Abs Max Pt:** N/A ; **Abs Min Pt:**  $(0,0)$
12. **Range:**  $[0, +\infty)_y$

# Cube Root FUNCTION: $y = f(x) = \sqrt[3]{x} = x^{1/3}$



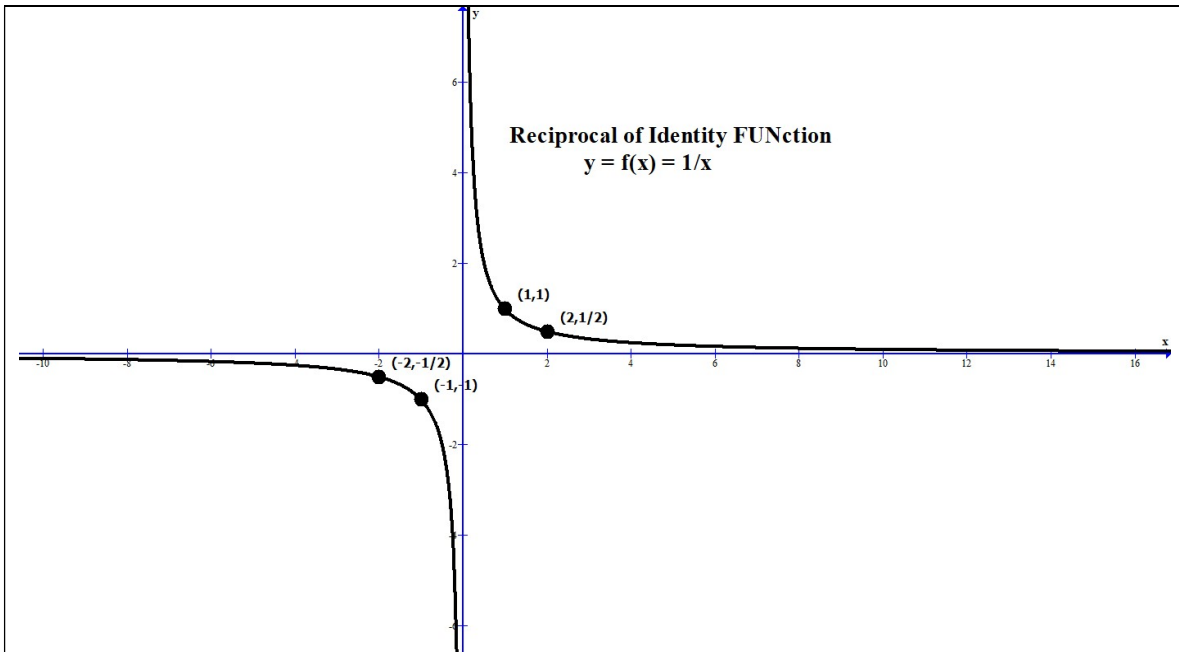
1. **Domain:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points:**  $y: (0,0)$  ;  $x: (0,0)$
3. **Continuity:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
  - a.  $x \rightarrow -\infty \Rightarrow f(x) \rightarrow -\infty$  ... slowly
  - b.  $x \rightarrow +\infty \Rightarrow f(x) \rightarrow +\infty$  ... slowly
5. **Odd/Even:** Odd
6. **Inc f:**  $(-\infty, +\infty)_x$  ; **Dec f:** N/A
7. **Rel Max Pt:** N/A ; **Rel Min Pt:** N/A
8. **CU f:**  $(-\infty, 0]_x$  ; **CD f:**  $[0, +\infty)_x$
9. **Inf Pt:**  $(0,0)$
10. **Graph:** Above
11. **Abs Max Pt:** N/A ; **Abs Min Pt:** N/A
12. **Range:**  $(-\infty, +\infty)_y$

## Absolute Value FUNCTION: $y = f(x) = |x| = \text{Abs}(x)$



1. **Domain:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points:**  $y: (0,0)$  ;  $x: (0,0)$
3. **Continuity:**  $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
  - a.  $x \rightarrow -\infty \Rightarrow f(x) \rightarrow +\infty$
  - b.  $x \rightarrow +\infty \Rightarrow f(x) \rightarrow +\infty$
5. **Odd/Even:** Even
6. **Inc f:**  $[0, +\infty)_x$  ; **Dec f:**  $(-\infty, 0]_x$
7. **Rel Max Pt:** N/A ; **Rel Min Pt:**  $(0,0)$
8. **CU f:**  $(-\infty, +\infty)_x$  ; **CD f:** N/A
9. **Inf Pt:** N/A
10. **Graph:** Above
11. **Abs Max Pt:** N/A ; **Abs Min Pt:**  $(0,0)$
12. **Range:**  $[0, +\infty)_y$

# Reciprocal Identity FUNCTION: $y = f(x) = \frac{1}{x}$



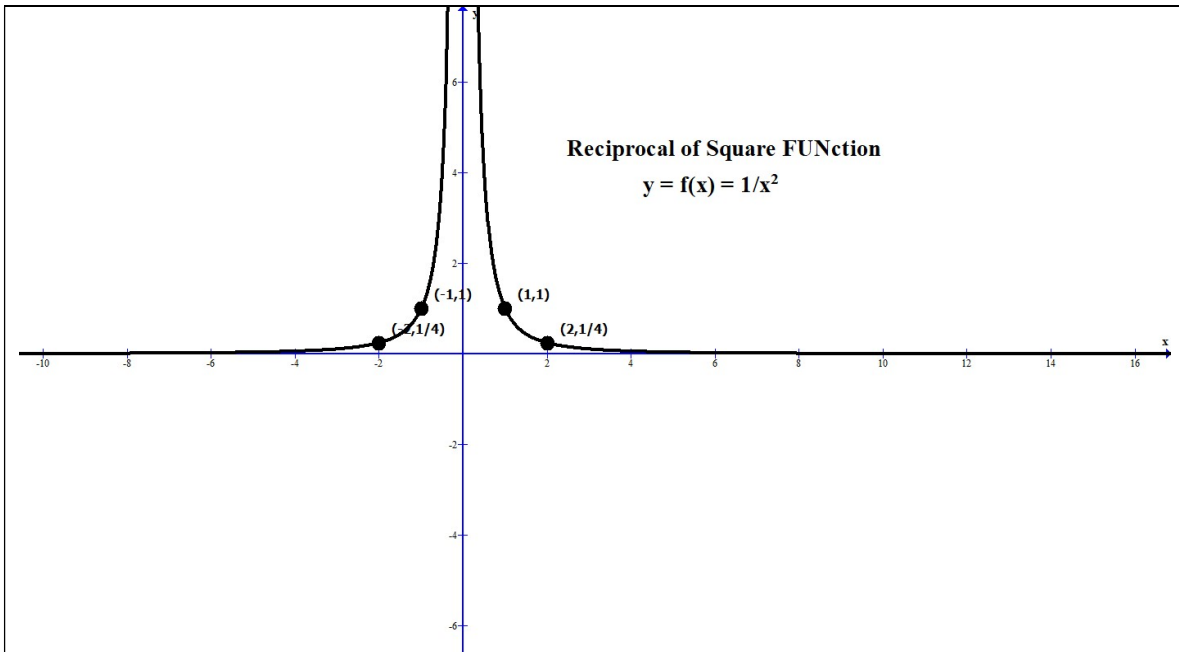
1. **Domain:**  $\mathbb{R}_x \setminus \{0\} = (-\infty, 0) \cup (0, +\infty)_x$
2. **Intercept Points:** N/A
3. **Continuity:**  $\mathbb{R}_x \setminus \{0\} = (-\infty, 0) \cup (0, +\infty)_x$ 

Vertical Asymptote: Line  $x = 0$
4. **Behavior at Infinity:**
  - a.  $x \rightarrow -\infty \Rightarrow f(x) \rightarrow 0$
  - b.  $x \rightarrow +\infty \Rightarrow f(x) \rightarrow 0$

Horizontal Asymptote: Line  $y = 0$
5. **Odd/Even:** Odd
6. **Inc f:** N/A; **Dec f:**  $(-\infty, 0) \cup (0, +\infty)_x$
7. **Rel Max Pt:** N/A ; **Rel Min Pt:** N/A
8. **CU f:**  $(0, +\infty)_x$  ; **CD f:**  $(-\infty, 0)_x$
9. **Inf Pt:** N/A
10. **Graph:** Above
11. **Abs Max Pt:** N/A ; **Abs Min Pt:** N/A
12. **Range:**  $\mathbb{R}_y \setminus \{0\} = (-\infty, 0) \cup (0, +\infty)_y$



# Reciprocal Square FUNCTION: $y = f(x) = \frac{1}{x^2}$



1. **Domain:**  $\mathbb{R}_x \setminus \{0\} = (-\infty, 0) \cup (0, +\infty)_x$
2. **Intercept Points:** N/A
3. **Continuity:**  $\mathbb{R}_x \setminus \{0\} = (-\infty, 0) \cup (0, +\infty)_x$ 

Vertical Asymptote: Line  $x = 0$
4. **Behavior at Infinity:**
  - a.  $x \rightarrow -\infty \Rightarrow f(x) \rightarrow 0$
  - b.  $x \rightarrow +\infty \Rightarrow f(x) \rightarrow 0$

Horizontal Asymptote: Line  $y = 0$
5. **Odd/Even:** Even
6. **Inc f:**  $(-\infty, 0)_x$ ; **Dec f:**  $(0, +\infty)_x$
7. **Rel Max Pt:** N/A; **Rel Min Pt:** N/A
8. **CU f:**  $(-\infty, 0) \cup (0, +\infty)_x$ ; **CD f:** N/A
9. **Inf Pt:** N/A
10. **Graph:** Above
11. **Abs Max Pt:** N/A; **Abs Min Pt:** N/A
12. **Range:**  $(0, +\infty)_y$