FUNctions - Basic Graphs

[Constant, Identity, Square, Cube, Absolute Value, …]

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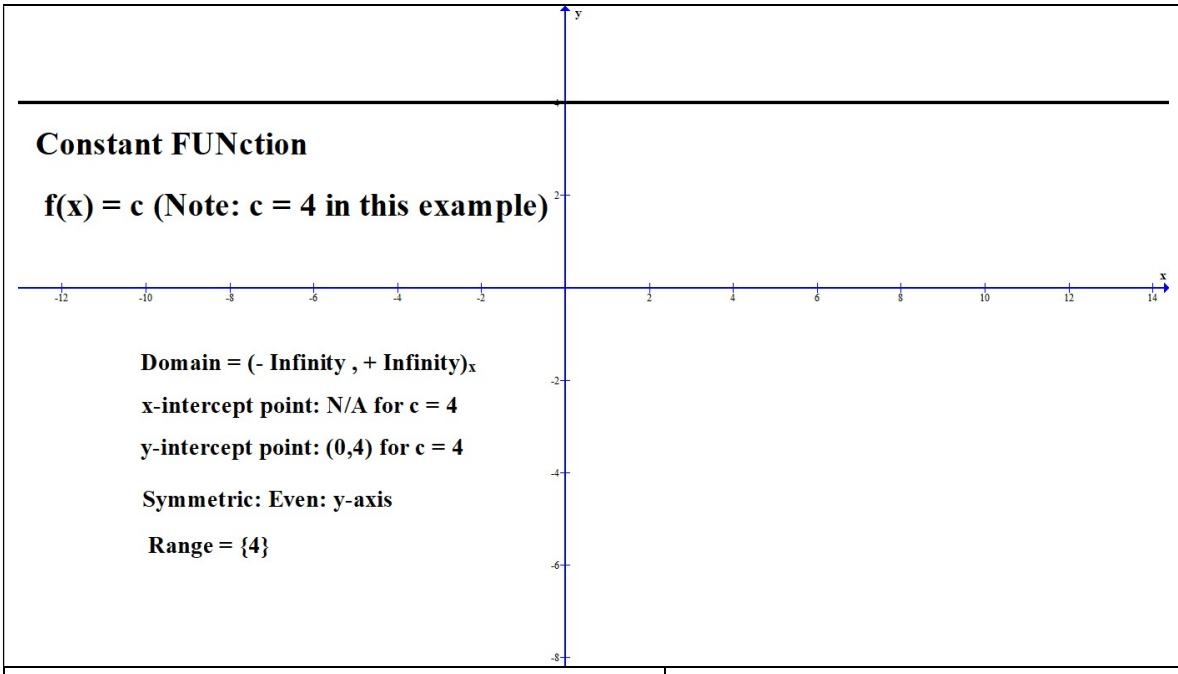
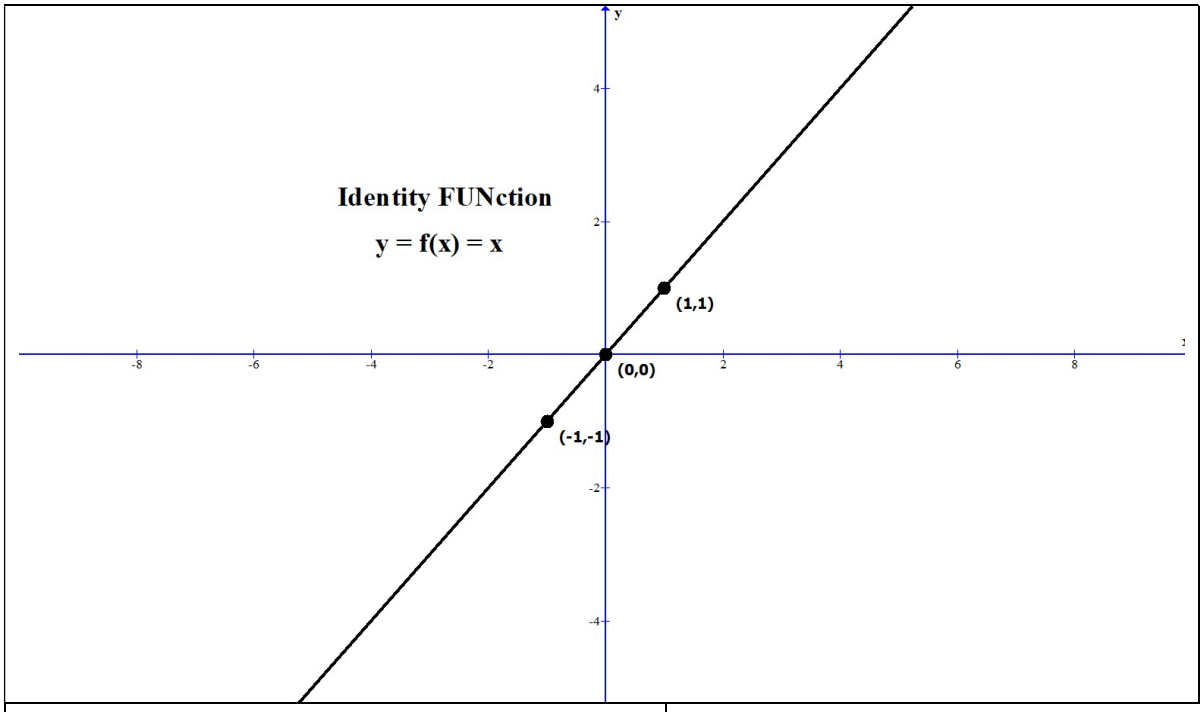
Just as bricks are used to construct various structures, there are Basic FUNctions that are used to form complicated functions which describe real-world phenomenon. The following Basic FUNctions, together with their properties and graphs, are just a few of them.

Constant FUNction: $y = f(x) = c\ ;\ c \in \mathbb{R}$



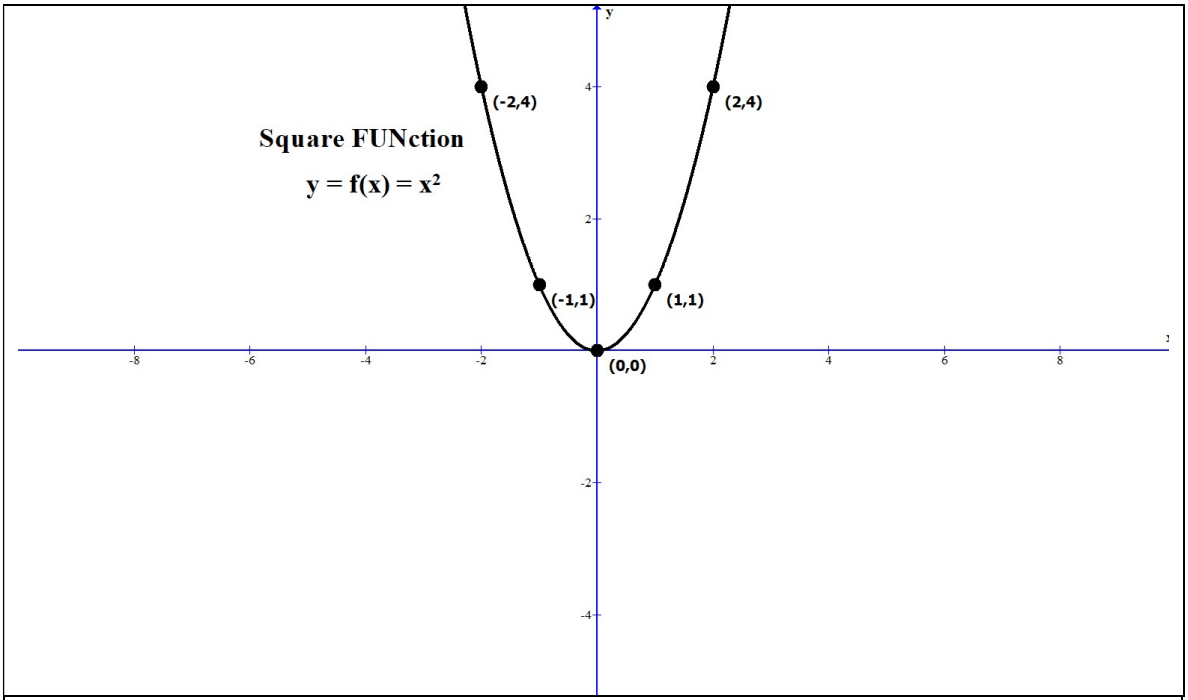
1. **Domain:** $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points: y:** $(0,4)$; **x:** N/A
3. **Continuity:** $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
   a. $x \to -\infty \Rightarrow f(x) \to 4$
   b. $x \to +\infty \Rightarrow f(x) \to 4$
5. **Odd/Even: Even**
6.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

Identity FUNction: $y = f(x) = x$



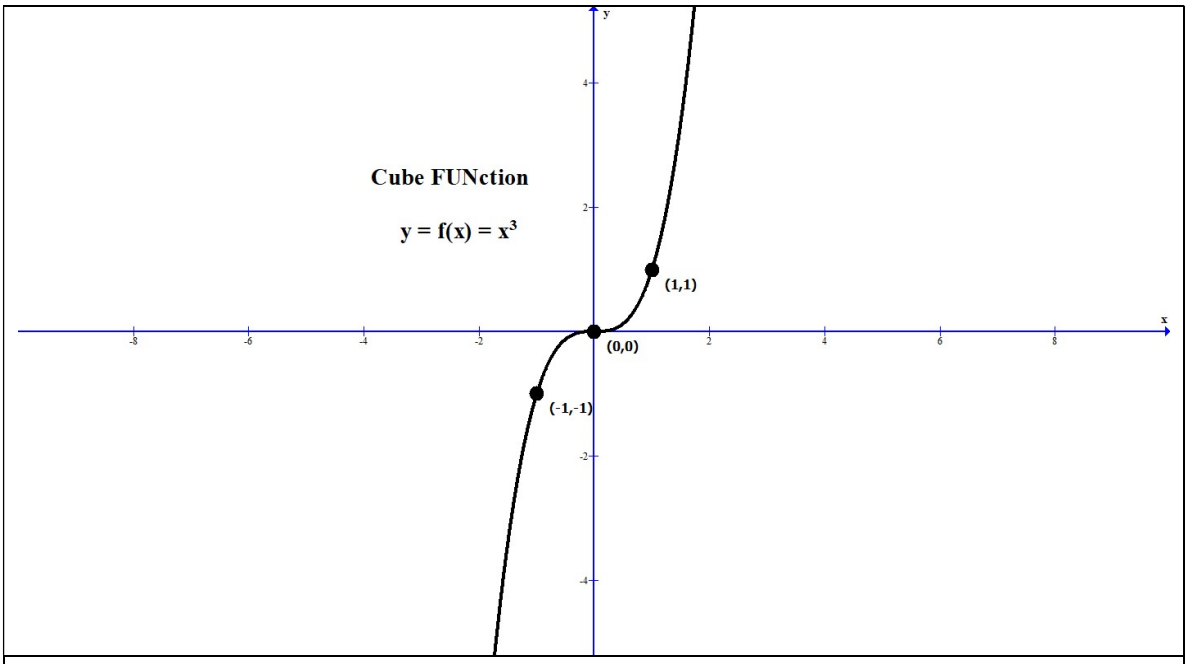
1. **Domain:** $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points: y:** $(0,0)$; **x:** $(0,0)$
3. **Continuity:** $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
   a. $x \to -\infty \Rightarrow f(x) \to -\infty$
   b. $x \to +\infty \Rightarrow f(x) \to +\infty$
5. **Odd/Even:** 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: $y = f(x) = x^2$



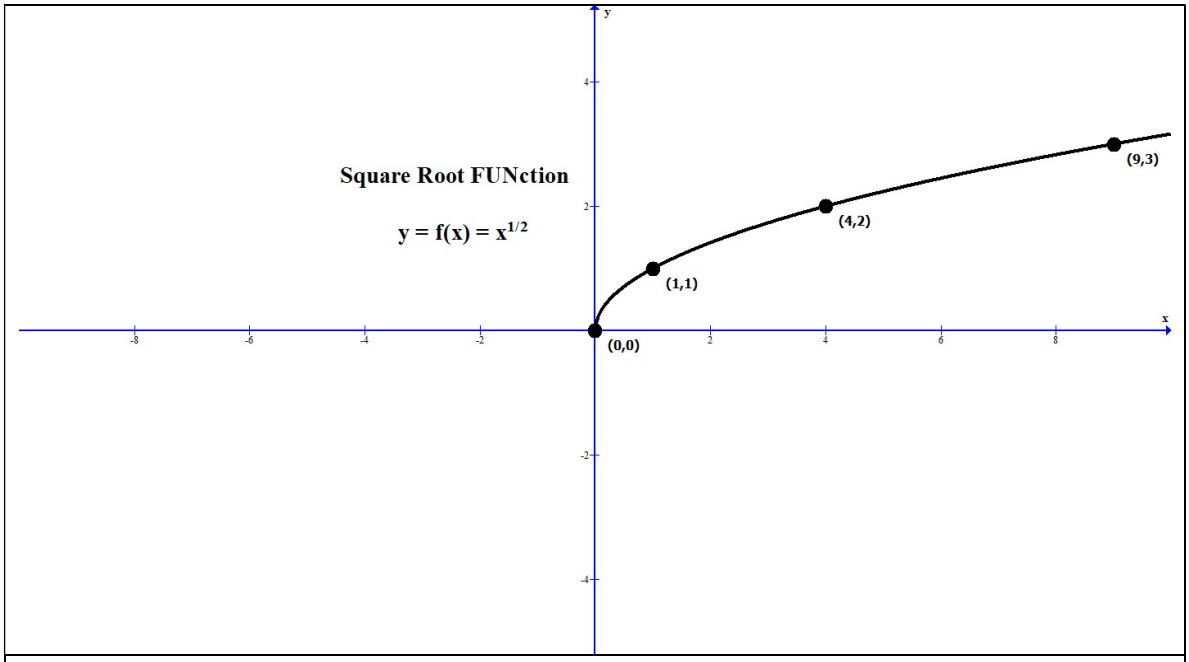
1. **Domain:** $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points: y:** $(0,0)$; **x:** $(0,0)$
3. **Continuity:** $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
   a. $x \to -\infty \Rightarrow f(x) \to +\infty$
   b. $x \to +\infty \Rightarrow f(x) \to +\infty$
5. **Odd/Even:** 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: $y = f(x) = x^3$



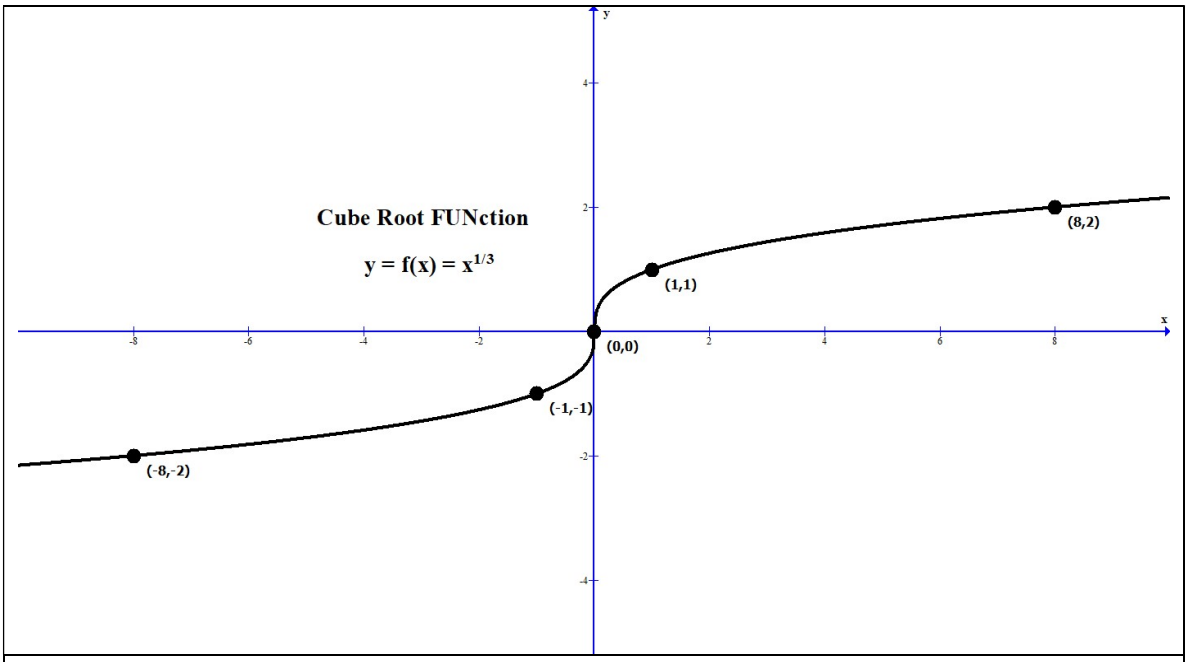
1. **Domain:** $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points: y:** $(0,0)$; **x:** $(0,0)$
3. **Continuity:** $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
   a. $x \to -\infty \Rightarrow f(x) \to -\infty$
   b. $x \to +\infty \Rightarrow f(x) \to +\infty$
5. **Odd/Even:** 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: $y = f(x) = \sqrt[2]{x} = \sqrt{x} = x^{1/2}$



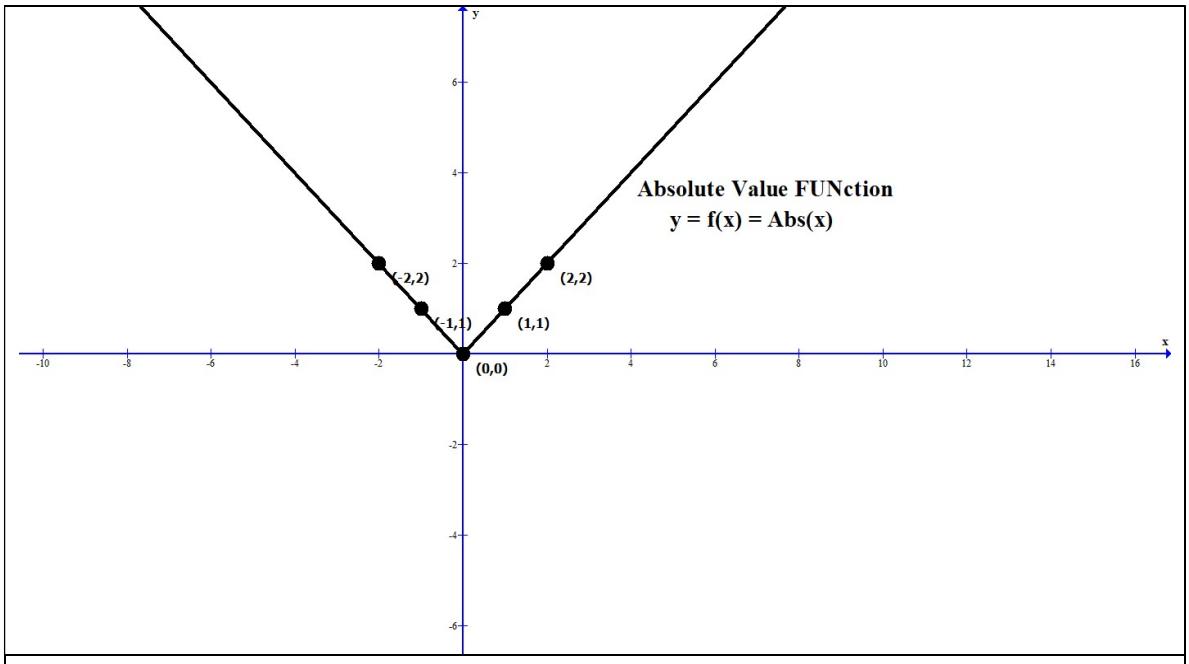
1. **Domain:** $[0,+\infty)_x$
2. **Intercept Points: y:** $(0,0)$; **x:** $(0,0)$
3. **Continuity:** $[0,+\infty)_x$
4. **Behavior at Infinity:**
   a. $x \to -\infty \Rightarrow f(x) \to$ N/A
   b. $x \to +\infty \Rightarrow f(x) \to +\infty$ … slowly
5. **Odd/Even:** Neither
6. **Inc f :** $[0,+\infty)_x$; **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: $y = f(x) = \sqrt[3]{x} = x^{1/3}$



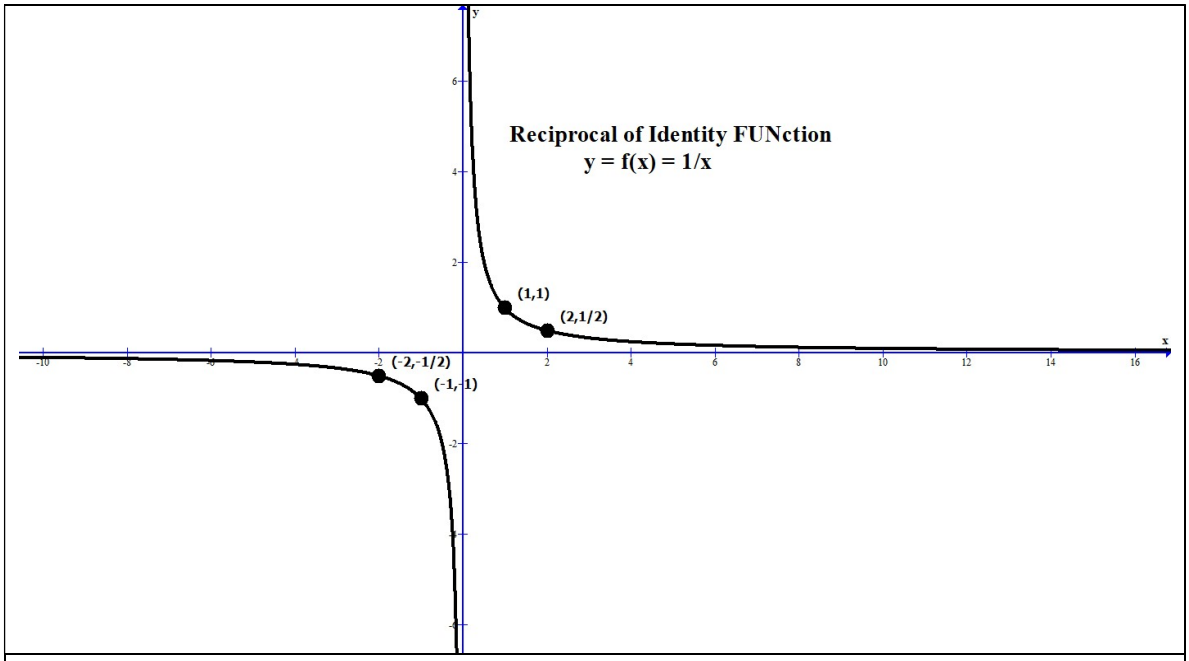
1. **Domain:** $\mathbb{R}_x = (-\infty, +\infty)_x$
2. **Intercept Points: y:** $(0,0)$; **x:** $(0,0)$
3. **Continuity:** $\mathbb{R}_x = (-\infty, +\infty)_x$
4. **Behavior at Infinity:**
   a. $x \to -\infty \Rightarrow f(x) \to -\infty$ … slowly
   b. $x \to +\infty \Rightarrow f(x) \to +\infty$ … 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. $x \to -\infty \Rightarrow f(x) \to +\infty$
   b. $x \to +\infty \Rightarrow f(x) \to +\infty$
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:**

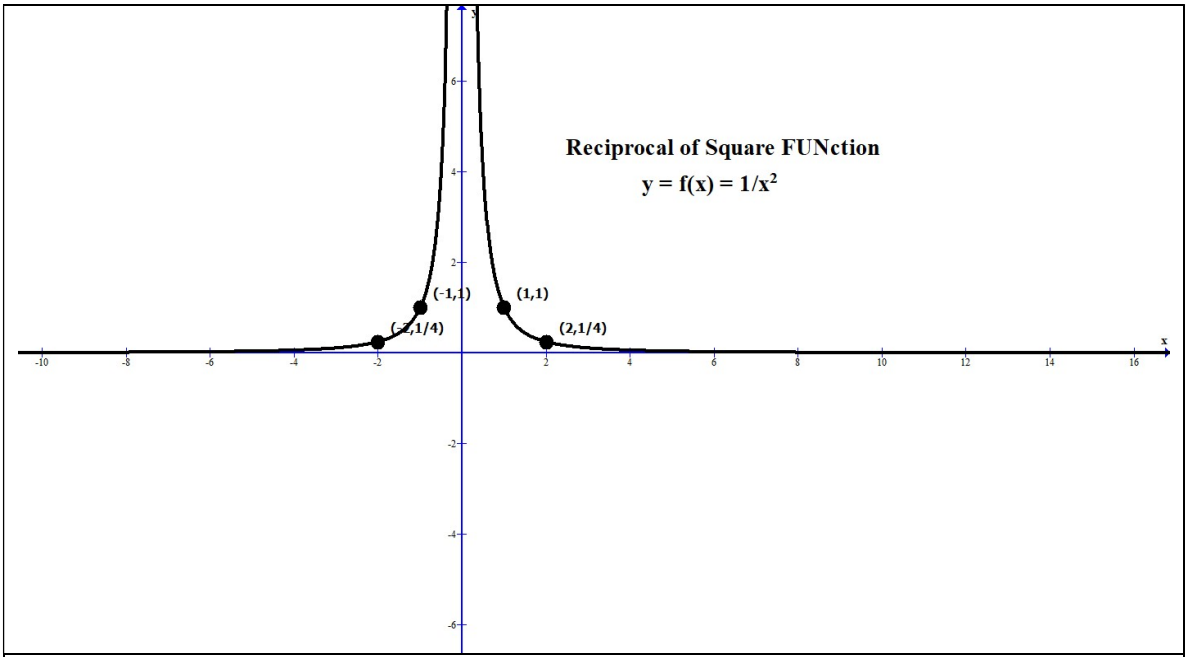
   a. $x \to -\infty \Rightarrow f(x) \to 0$

   b. $x \to +\infty \Rightarrow f(x) \to 0$

   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. $x \to -\infty \Rightarrow f(x) \to 0$

   b. $x \to +\infty \Rightarrow f(x) \to 0$

   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:** $(0, +\infty)_y$