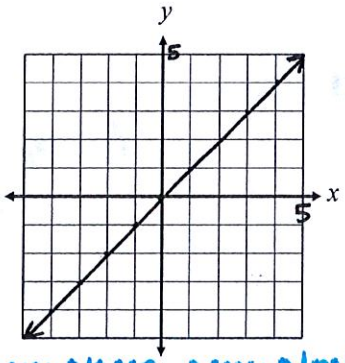
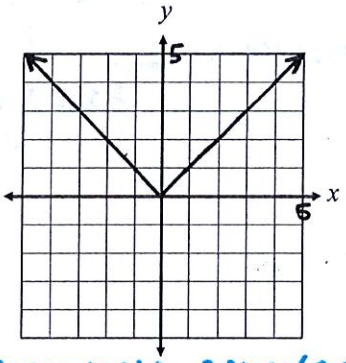
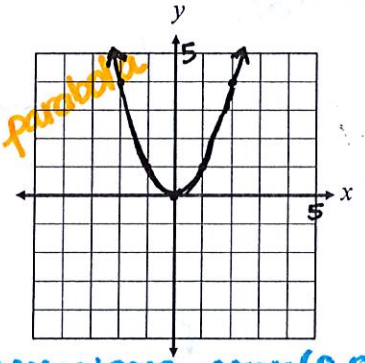
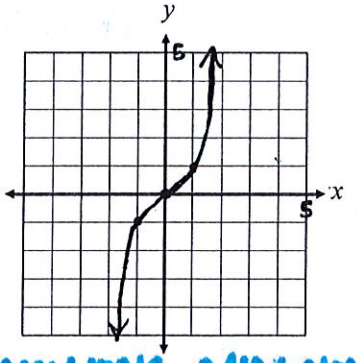
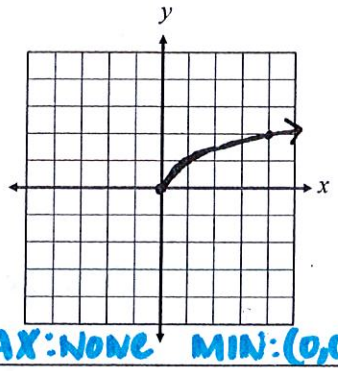
2.4 PARENT FUNCTIONS

A **family of graphs** displays similar characteristics.
A **parent function** is the simplest function of the family.

PARENT FUNCTION	GRAPH	CHARACTERISTICS
LINEAR $f(x) = x$	 MAX: NONE MIN: NONE	• D: $(-\infty, \infty)$; R: $(-\infty, \infty)$ • x-intercept: $(0,0)$; y-intercept: $(0,0)$ • Maximum Number of Roots/Zeros: 1 • End Behavior: As $x \to -\infty$, $f(x) \to -\infty$ As $x \to \infty$, $f(x) \to \infty$ • Continuous / Discontinuous
ABSOLUTE VALUE $f(x) = \lvert x \rvert$	 MAX: NONE MIN: (0,0)	• D: $(-\infty, \infty)$; R: $[0, \infty)$ • x-intercept: $(0,0)$; y-intercept: $(0,0)$ • Maximum Number of Roots/Zeros: 2 • End Behavior: As $x \to -\infty$, $f(x) \to \infty$ As $x \to \infty$, $f(x) \to \infty$ • Continuous / Discontinuous AOS: $x = 0$
QUADRATIC $f(x) = x^2$	 MAX: NONE MIN: (0,0)	• D: $(-\infty, \infty)$; R: $[0, \infty)$ • x-intercept: $(0,0)$; y-intercept: $(0,0)$ • Maximum Number of Roots/Zeros: 2 • End Behavior: As $x \to -\infty$, $f(x) \to \infty$ As $x \to \infty$, $f(x) \to \infty$ • Continuous / Discontinuous AOS: $x = 0$
CUBIC $f(x) = x^3$	 MAX: NONE MIN: NONE	• D: $(-\infty, \infty)$; R: $(-\infty, \infty)$ • x-intercept: $(0,0)$; y-intercept: $(0,0)$ • Maximum Number of Roots/Zeros: 3 • End Behavior: As $x \to -\infty$, $f(x) \to -\infty$ As $x \to \infty$, $f(x) \to \infty$ • Continuous / Discontinuous

SQUARE ROOT

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

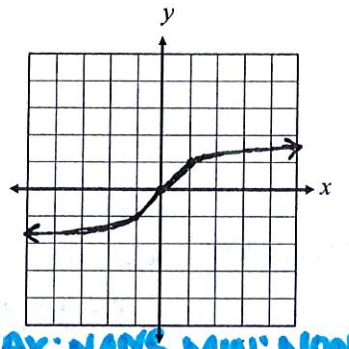


MAX: NONE MIN: (0,0)

- D: [0, ∞) ; R: [0, ∞)
- x-intercept: (0,0) ; y-intercept: (0,0)
- Maximum Number of Roots/Zeros: 1
- End Behavior: As $x \to$ 0, $f(x) \to$ 0
  As $x \to \infty$, $f(x) \to \infty$
- Continuous / Discontinuous ?

CUBE ROOT

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

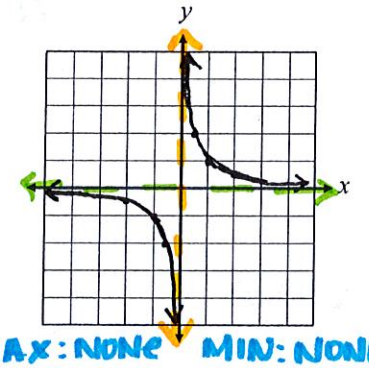


MAX: NONE MIN: NONE

- D: (−∞, ∞) ; R: (−∞, ∞)
- x-intercept: (0,0) ; y-intercept: (0,0)
- Maximum Number of Roots/Zeros: 1
- End Behavior: As $x \to -\infty$, $f(x) \to -\infty$
  As $x \to \infty$, $f(x) \to \infty$
- Continuous / Discontinuous

RECIPROCAL

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



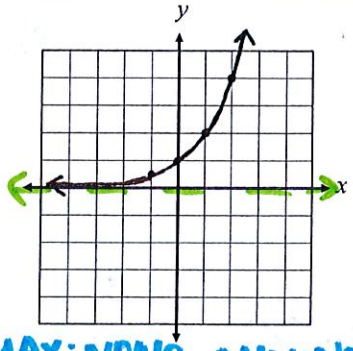
MAX: NONE MIN: NONE

- D: {x | x ≠ 0} ; R: {y | y ≠ 0}
- x-intercept: NONE ; y-intercept: NONE
- Maximum Number of Roots/Zeros: 1
- End Behavior: As $x \to -\infty$, $f(x) \to$ 0
  As $x \to \infty$, $f(x) \to$ 0
- Continuous / Discontinuous
- Asymptotes: x = 0 y = 0

EXPONENTIAL

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

$g(x) = b^x$



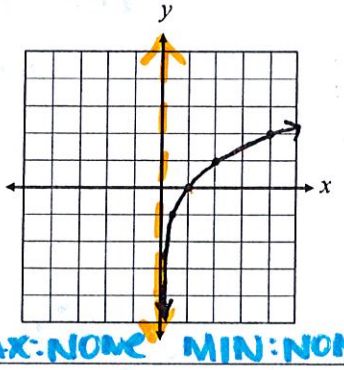
MAX: NONE MIN: NONE

- D: (−∞, ∞) ; R: (0, ∞)
- x-intercept: NONE ; y-intercept: (0,1)
- Maximum Number of Roots/Zeros: 1
- End Behavior: As $x \to -\infty$, $f(x) \to$ 0
  As $x \to \infty$, $f(x) \to \infty$
- Continuous / Discontinuous
- Asymptotes: y = 0

LOGARITHMIC

$f(x) = \log_2 x$ (on graph)

$g(x) = \log_b x$



MAX: NONE MIN: NONE

- D: (0, ∞) ; R: (−∞, ∞)
- x-intercept: (1,0) ; y-intercept: NONE
- Maximum Number of Roots/Zeros: 1
- End Behavior: As $x \to$ 0, $f(x) \to -\infty$
  As $x \to \infty$, $f(x) \to \infty$
- Continuous / Discontinuous ?
- Asymptotes: x = 0