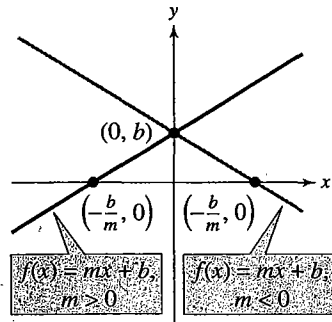


GRAPHS OF PARENT FUNCTIONS

Linear Function

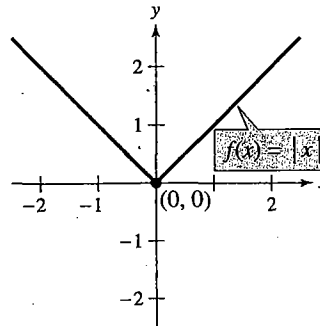
$$f(x) = mx + b$$



Domain: $(-\infty, \infty)$
 Range: $(-\infty, \infty)$
 x-intercept: $(-b/m, 0)$
 y-intercept: $(0, b)$
 Increasing when $m > 0$
 Decreasing when $m < 0$

Absolute Value Function

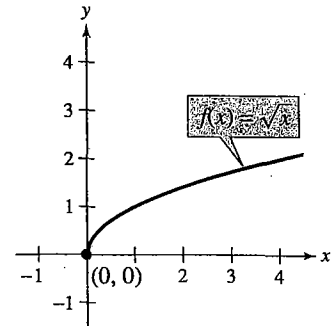
$$f(x) = |x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$



Domain: $(-\infty, \infty)$
 Range: $[0, \infty)$
 Intercept: $(0, 0)$
 Decreasing on $(-\infty, 0)$
 Increasing on $(0, \infty)$
 Even function
 y-axis symmetry

Square Root Function

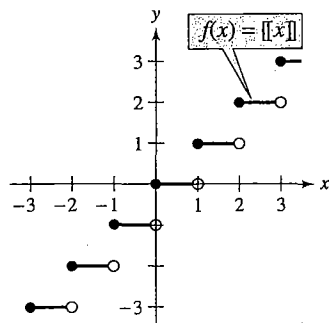
$$f(x) = \sqrt{x}$$



Domain: $[0, \infty)$
 Range: $[0, \infty)$
 Intercept: $(0, 0)$
 Increasing on $(0, \infty)$

Greatest Integer Function

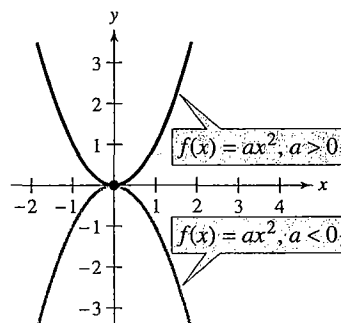
$$f(x) = \llbracket x \rrbracket$$



Domain: $(-\infty, \infty)$
 Range: the set of integers
 x-intercepts: in the interval $[0, 1)$
 y-intercept: $(0, 0)$
 Constant between each pair of consecutive integers
 Jumps vertically one unit at each integer value

Quadratic (Squaring) Function

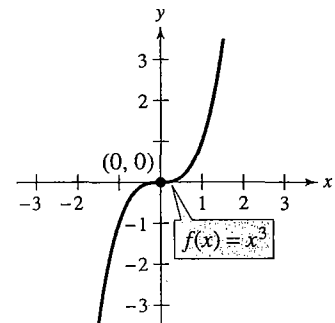
$$f(x) = ax^2$$



Domain: $(-\infty, \infty)$
 Range ($a > 0$): $[0, \infty)$
 Range ($a < 0$): $(-\infty, 0]$
 Intercept: $(0, 0)$
 Decreasing on $(-\infty, 0)$ for $a > 0$
 Increasing on $(0, \infty)$ for $a > 0$
 Increasing on $(-\infty, 0)$ for $a < 0$
 Decreasing on $(0, \infty)$ for $a < 0$
 Even function
 y-axis symmetry
 Relative minimum ($a > 0$),
 relative maximum ($a < 0$),
 or vertex: $(0, 0)$

Cubic Function

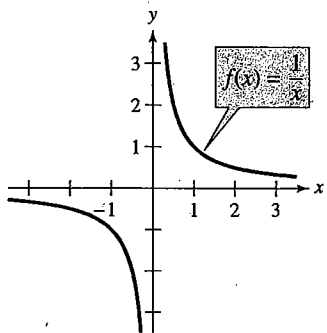
$$f(x) = x^3$$



Domain: $(-\infty, \infty)$
 Range: $(-\infty, \infty)$
 Intercept: $(0, 0)$
 Increasing on $(-\infty, \infty)$
 Odd function
 Origin symmetry

Rational (Reciprocal) Function

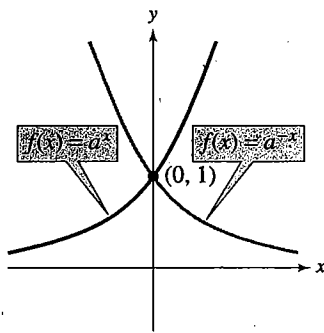
$$f(x) = \frac{1}{x}$$



Domain: $(-\infty, 0) \cup (0, \infty)$
 Range: $(-\infty, 0) \cup (0, \infty)$
 No intercepts
 Decreasing on $(-\infty, 0)$ and $(0, \infty)$
 Odd function
 Origin symmetry
 Vertical asymptote: y-axis
 Horizontal asymptote: x-axis

Exponential Function

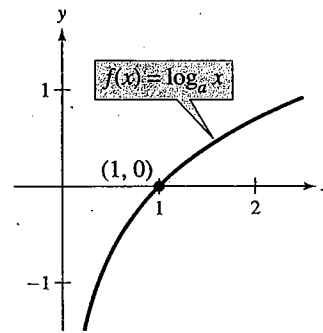
$$f(x) = a^x, a > 0, a \neq 1$$



Domain: $(-\infty, \infty)$
 Range: $(0, \infty)$
 Intercept: $(0, 1)$
 Increasing on $(-\infty, \infty)$
 for $f(x) = a^x$
 Decreasing on $(-\infty, \infty)$
 for $f(x) = a^{-x}$
 Horizontal asymptote: x-axis
 Continuous

Logarithmic Function

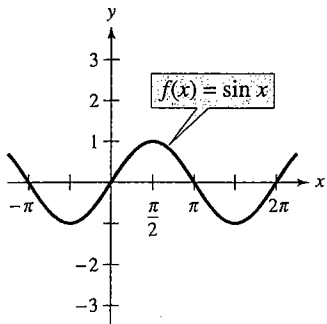
$$f(x) = \log_a x, a > 0, a \neq 1$$



Domain: $(0, \infty)$
 Range: $(-\infty, \infty)$
 Intercept: $(1, 0)$
 Increasing on $(0, \infty)$
 Vertical asymptote: y-axis
 Continuous
 Reflection of graph of $f(x) = a^x$
 in the line $y = x$

Sine Function

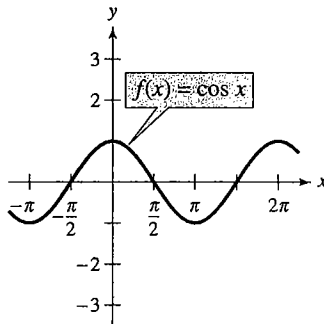
$$f(x) = \sin x$$



Domain: $(-\infty, \infty)$
 Range: $[-1, 1]$
 Period: 2π
 x-intercepts: $(n\pi, 0)$
 y-intercept: $(0, 0)$
 Odd function
 Origin symmetry

Cosine Function

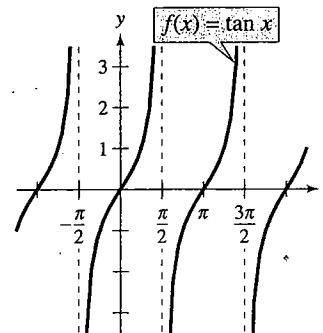
$$f(x) = \cos x$$



Domain: $(-\infty, \infty)$
 Range: $[-1, 1]$
 Period: 2π
 x-intercepts: $(\frac{\pi}{2} + n\pi, 0)$
 y-intercept: $(0, 1)$
 Even function
 y-axis symmetry

Tangent Function

$$f(x) = \tan x$$



Domain: all $x \neq \frac{\pi}{2} + n\pi$
 Range: $(-\infty, \infty)$
 Period: π
 x-intercepts: $(n\pi, 0)$
 y-intercept: $(0, 0)$
 Vertical asymptotes:
 $x = \frac{\pi}{2} + n\pi$
 Odd function
 Origin symmetry