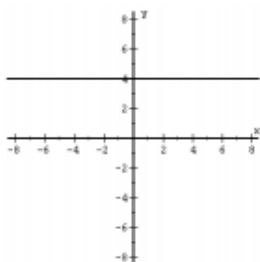
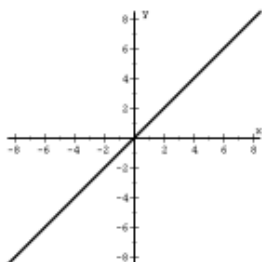


Transformations of Functions

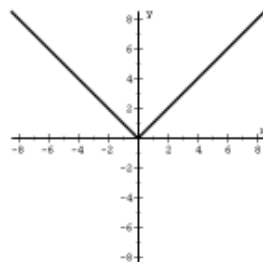
PARENT FUNCTIONS



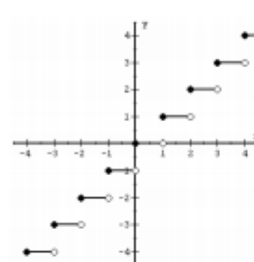
$f(x) = a$
Constant



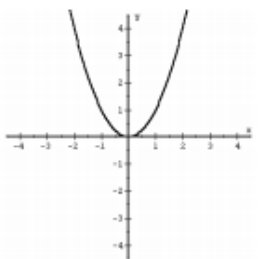
$f(x) = x$
Linear



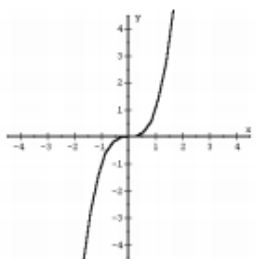
$f(x) = |x|$
Absolute Value



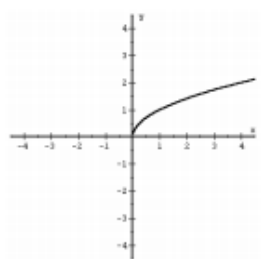
$f(x) = \text{int}(x) = [x]$
Greatest Integer



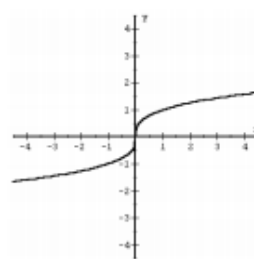
$f(x) = x^2$
Quadratic



$f(x) = x^3$
Cubic



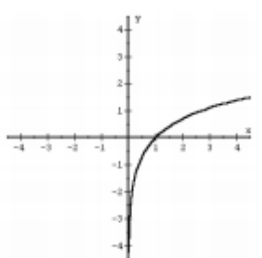
$f(x) = \sqrt{x}$
Square Root



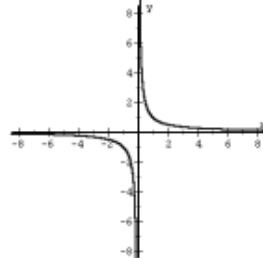
$f(x) = \sqrt[3]{x}$
Cube Root



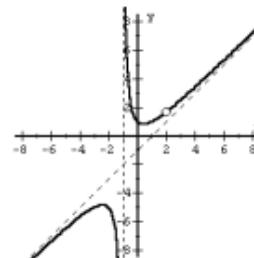
$f(x) = a^x$
Exponential



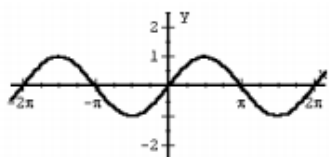
$f(x) = \log_a x$
Logarithmic



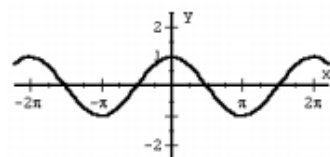
$f(x) = \frac{1}{x}$
Reciprocal



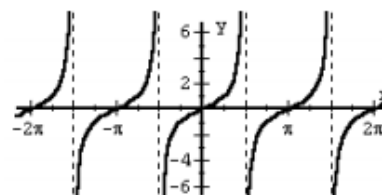
$f(x) = \frac{(x^2 + 1)(x - 2)}{(x + 1)(x - 2)}$
Rational



$f(x) = \sin x$

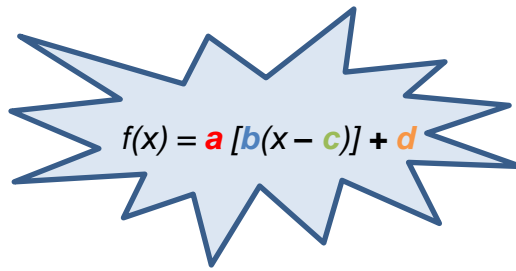


$f(x) = \cos x$



$f(x) = \tan x$

Trigonometric Functions


$$f(x) = a [b(x - c)] + d$$

a: VERTICAL Stretch/Compress and Reflection ($x, a \cdot y$)

$a > 1$: Vertical stretch by a factor of a

$0 < a < 1$: Vertical compression by a factor of a

$a < 0$: Reflection over the x-axis ($x, -y$)

b: HORIZONTAL Stretch/Compress and Reflection ($\frac{1}{b} \cdot x, y$)

$b > 1$: Horizontal compression by a factor of $\frac{1}{b}$

$0 < b < 1$: Horizontal stretch by a factor of $\frac{1}{b}$

$b < 0$: Reflection over the y-axis ($-x, y$)

c: HORIZONTAL Shift ($x+c, y$)

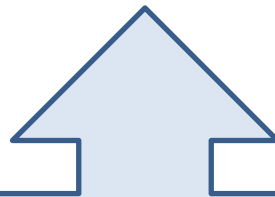
$c > 0$: Horizontal shift right by c

$c < 0$: Horizontal shift left by c

d: VERTICAL Shift ($x, y+d$)

$d > 0$: Vertical shift up by d

$d < 0$: Vertical shift down by d



Steps for Graphing:

- 1) Horizontal Shift (c)
- 2) Stretch/Compress (a & b)
- 3) Reflection (a & b)
- 4) Vertical Shift (d)