[1.3] TRANSFORMATIONS OUTLINE

I. SHIFTS OF $f(x)$

A. Vertical: $g(x) = f(x) + a$
If $a > 0$, *graph shifts upward*
If $a < 0$, *graph shifts downward*

B. Horizontal: $g(x) = f(x + a)$
If $a > 0$, *graph shifts left*
If $a < 0$, *graph shifts right*

II. STRETCHES OF $f(x)$

A. Vertical: $g(x) = a \cdot f(x)$
If $a > 0$, *graph expands BFO* a
If $0 < a < 1$, *graph shrinks BFO* $1/a$

B. Horizontal: $g(x) = f(a \cdot x)$
If $a > 0$, *graph shrinks BFO* $1/a$
If $0 < a < 1$, *graph expands BFO* a

III. REFLECTIONS OF $f(x)$

A. Vertical:
$f(x)$ *and* $-f(x)$
are reflections
over the $x-$*axis*

B. Horizontal:
$f(x)$ *and* $f(-x)$
are reflections
over the $y-$*axis*

IV. COMPOSITE FUNCTIONS

$f(g(x))$ *or* $(f \circ g(x))$

V. INVERTIBLE FUNCTIONS – PROPERTIES

A. $one - to - one$

B. $symmetric\ over\ \ y = x$

C. $f(f^{-1}(x)) = x\ \ and\ \ f^{-1}(f(x)) = x$

D. $If\ \ (a, b) \in f,\ then\ \ (b, a) \in f^{-1}$

E. $Domain\ of\ \ f\ \ is\ the\ range\ of\ \ f^{-1}$

VI. EVEN FUNCTIONS – PROPERTIES

A. $f(-x) = f(x)$

B. $Symmetric\ over\ the\ y - axis$

C. $For\ every\ (a, b) \in f,\ \ (-a, b) \in f$

VII. ODD FUNCTIONS – PROPERTIES

A. $f(-x) = -f(x)$

B. $Symmetric\ over\ the\ origin$

C. $For\ every\ (a, b) \in f,\ \ (-a, -b) \in f$