Rules From Arithmetic and Algebra

Revised 5/06

Suppose ***a***, ***b***, and ***c*** stand for Real Numbers.

1. Commutative Laws: $a+b = b+a$; $a \cdot b = b \cdot a$

2. Associative Laws: $a+(b+c) = (a+b)+c$; $a(bc) = (ab)c$

3. Distributive Law: $a(b+c) = ab + ac$

4. Additive Identity: There is a number called 0 such that $a+0 = a$ no matter what real number a stands for.

5. Multiplicative Identity: There is a number called 1 such that $1 \cdot a = a$ no matter what number a stands for.

6. Additive Inverse: Every real number a has an additive inverse $(-a)$ so that when you add them you get zero: $a+(-a) = 0$.

7. Multiplicative Inverse: Every real number a, except zero (the additive identity), has a multiplicative inverse a^{-1} so that when you multiply them, you get 1: $a \cdot a^{-1} = 1$

8. When you multiply all parts of an inequality by a positive number, the sense of inequality stays the same. *If $a<b$ and $c>0$ then $ac < bc$. If $a \le b$ and $c>0$ then $ac \le bc$. If $a > b$ and $c>0$ then $ac > bc$,* etc.

9. When you multiply all parts of an inequality by a <u>negative</u> number, the sense of inequality reverses. *If $a<b$ and $c<0$ then $ac > bc$. If $a \le b$ and $c<0$ then $ac \ge bc$. If $a>b$ and $c<0$ then $ac < bc$,* etc.

10. You can <u>add (or subtract)</u> any number to (or from) all parts of an inequality without changing the sense of the inequality: *$a<b$ means $a+c < b+c$; $a>b$ means $a+c > b+c$, $a \le b$ means $a + c \le b + c$*, etc. no matter what number c is.

11. You can add, subtract, multiply, or divide all parts of any <u>equality</u> by any number (except zero) without changing its truth. *The equality $a=b$ means $a+c = b+c$, $a - c = b - c$, $a \cdot c = b \cdot c$ and $\frac{a}{c} = \frac{b}{c}$, so long as, in the division, c is not zero.*

12. Theorem A: $|x| < a$ means $-a < x < a$.

13. Theorem B: $|x| > a$ means $x > a$ or $x < -a$.

14. Zero Factor Property: If $a \cdot b = 0$ then $a = 0$ OR $b = 0$.