Limits and Continuity of Elementary Functions

Before giving the important theorem and associated corollary covering limits and continuity of *elementary functions*, we define the following:

Definition: An *elementary function* is a single variable *Real* function expressed as the composition of a finite number of arithmetic operations (addition, subtraction, multiplication, and division), exponentiation (including powers and roots), constants, absolute value, and the transcendental functions: exponential, logarithmic, trigonometric, inverse trigonometric, hyperbolic, and inverse hyperbolic.

Definition: The *interior of the domain* of a single variable *Real* function comprises all points in all *open* intervals of *Real* numbers (if any) of the function's domain. Note that an open interval must not be of zero-width (that is, an open interval cannot be a single point).

Theorem: *Direct Substitution Rule.* For any point c in the *interior of the domain* of *elementary function* $f(x)$, $\lim\limits_{x \to c} f(x) = f(c)$.

Corollary: An *elementary function* is continuous in the *interior of its domain.*