On the neutrix composition of the delta and inverse hyperbolic sine functions.

ABSTRACT

Let F be a distribution in D ' and let f be a locally summable function. The composition F (f(x)) of F and f is said to exist and be equal to the distribution h (x) if the limit of the sequence {Fn (f (x))} is equal to h (x), where Fn (x) = F (x) * δn (x) for n = 1,2,⋯ and {δn(x)} is a certain regular sequence converging to the Dirac delta function. In the ordinary sense, the composition δ(s) [(sinh-1 x+)r] does not exists. In this study, it is proved that the neutrix composition δ(s) [(sinh -1 x+)r] exists and is given by δ(s) [(sinh -1 x+)r]= ∑k=0 sr+r-1 ∑i=0 k (k i)((-1)k rc s,k,i /2k+1k!) δ(k) (x), for s = 0,1, 2,⋯ and r = 1,2,⋯ , where cs,k,i = (-1)s s ! [(k - 2 i + 1)rs-1 + (k - 2i - 1)rs+r-1]/(2 (r s + r - 1) !). Further results are also proved.

Keyword: Neutrix; Distributions.