

## On the composition and neutrix composition of the delta function and powers of the inverse hyperbolic sine function

### ABSTRACT

Lets  $F$  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  $\{F_n(f(x))\}$  is equal to  $h(x)$ , where  $F_n(x)=F(x)*\delta_n(x)$  for  $n=1, 2, \dots$  and  $\{\delta_n(x)\}$  is a certain regular sequence converging to the Dirac delta function. It is proved that the neutrix composition  $\delta[(\sinh x)^s]$  exists and for  $s=0, 1, 2, \dots$  and  $r=1, 2, \dots$ , where  $M$  is the smallest integer greater than  $(s-r +1)/r$  and Further results are also proved.

**Keyword:** Distribution; Delta function; Composition of distributions; Neutrix; Neutrix limit; Neutrix composition of distributions; 33B10; 46F10