Maximum numeric output for *data type* …

- **1:** $\pm 10^{999}$ with full 999-digit precision (though you can see and read a maximum of 294 digits "only" of such a number (cf. SHOW on p. 73).
- **2, 3, 8, 9, and 10:** The maxima are as specified for input above.
- **4:** For angular conversions, the maxima are as specified for input above. The functions ARCSIN, ARCCOS, and ARCTAN return values between $-\pi$ and π (or their equivalents) only.
- **5:** xxx
- **6:** xxx

Special Results (as of 2020-03-29)

Within this chapter, SPCRES is presumed to be set. Thus, infinities and non-numeric results are legal – no error message will be thrown if such results happen to occur (cf. the end of previous chapter).

The following monadic functions, if called with ℝ lit (i.e. CPXRES clear), return either ∞, -∞, or NaN under the conditions stated below:

Input x	Operation(s)	Output for ℝ lit
-1.	artanh	-∞
0 or 0.	ln, lg, lb x	
0.	1/x	∞
1.	artanh	
0 or 0.	Γ(x)	NaN
$\mathrm{Re}(x) < 1$	arcosh	
$\lvert\mathrm{Re}(x)\rvert > 1$	arccos, arcsin, artanh	
±90° or equivalents in other *ADM*	tan	

And the following monadic functions operate also on infinities:

Input x	Operation(s)	Output for ℝ lit
$-\infty$	x^3, $\sqrt[3]{x}$	$-\infty$
	arctan	-90.° or equivalents
	tanh	-1.
	$1/x$, e^x, 10^x, 2^x, sinc	0.
	x^2, arsinh	∞
$-\infty$	arcosh	NaN
$-\infty \le x < 0$	ln, lg, lb x	NaN
∞	$1/x$, sinc	0.
	tanh	1.
	arctan	90.° or equivalents
	ln, e^x, x^2, $\sqrt{x}$, lg, 10^x, lb x, x^3, $\sqrt[3]{x}$, sinh, cosh, arsinh, arcosh	∞
$-\infty$ or ∞	cos, sin, tan, artanh	NaN

For dyadic functions, we combined the respective tables:

Input y	x	Op.(s)	Output for ℝ lit [69]
∞	arbitrary $x \neq -\infty$	+	∞ [70]
$-\infty$	arbitrary $x \neq \infty$		$-\infty$ [70]
$-\infty$	∞	+	NaN [70]

[69] In this chapter, results were crosschecked against the *WP 34S* wherever possible. Deviations are highlighted. Additionally, *Wolfram Alpha* was used for checking results with finite arguments. Red results in the tables are considered wrong although they may concur with the *WP 34S*.

[70] Swapping x and y will return the same result here.

Input y x		Op.(s)	Output for ℝ lit [69]
∞	arbitrary $x \neq \infty$	−	∞ [71]
−∞	arbitrary $x \neq -\infty$		−∞ [71]
−∞	−∞	−	NaN
∞	∞		
∞	arbitrary $x > 0$	×	∞ [70]
−∞	arbitrary $x < 0$		
∞	arbitrary $x < 0$	×	−∞ [70]
−∞	arbitrary $x > 0$		
0 or 0.	−∞ or ∞	×	NaN [70]
$0 < y \leq \infty$	0.	/	∞
$-\infty \leq y < 0$			−∞
−∞ or ∞	−∞ or ∞	/	NaN
0 or 0.	0.	/, y^x	NaN
−∞ or ∞	0. or 0	y^x	NaN
$-\infty < y < 0$	non-integer x	y^x	NaN
−∞	odd $x > 0$	y^x	−∞
−∞	even $x > 0$		∞
∞	arbitrary $x > 0$	y^x	∞
arbitrary $y \neq 0$	−∞	y^x	0.
	∞		∞
0.	$0 < x < \infty$	$\log_x y$	−∞

The functions printed on light yellow background in the three tables above will return NaN (or NaN+i×NaN) also with *complex* results allowed (i.e. CPXRES set). Others will change their output when ℂ is lit. Some particular returns of elementary transient functions operating near ±∞ are listed on the next two pages:

[71] Swapping x and y will return this result times -1.

Input[72] Re(x)	Im(x)	r(x)	φ(x)	Op.	Output for ℂ lit
−∞	—	—		$\sqrt{x}$	∞ ∠ 90° = 0.+i×∞
−∞	0	∞	180°		
0.	10^{999}	10^{999}	90°	x^2	→ ∞ ∠ 180° = −∞+i×0.
	∞	∞			−∞+i×NaN
−∞	—	—		$\sqrt[3]{x}$	−∞
−∞	0	∞	180°		∞ ∠ 45° = ∞+i×∞ (*34S*: NaN+i×NaN)
-10^{999}		10^{999}			$1.\times10^{333} \angle 60° =$ $5.\times10^{332} + i\times8.660\,254\,037\times10^{332}$ $= 5 \times 10^{332}\left(1 + i \times \sqrt{3}\right)$
—		10^{333}	60°	x^3	$1.\times10^{999} \angle -180° =$ $-1.\times10^{999} + i\times0.$ $\rightarrow -\infty + i \times 0$
−∞	—	—		x^3	−∞
−∞	0	∞	180°		NaN+i×NaN
-10^{999}		10^{999}			$-1.\times10^{2997}+i\times0.$ $\rightarrow -\infty + i \times 0$
∞	—	—		ln	∞
∞	0	∞	0°		∞+i×∞ (*34S* returns ∞+i×0.)
10^{999}		10^{999}			$\rightarrow \infty + i \times 0$
-10^{999}	0	10^{999}	180°	ln	$\rightarrow \infty + i\pi$
−∞		∞			∞+i×∞ (*WP 34S* $= \infty + i\pi$)
−∞	—	—			NaN
∞	∞	∞	45°	ln	∞+i×∞
10^{999}	10^{999}	10^{999}			$\rightarrow \infty + i\,{}^{\pi}/_{4}$ (confirm. by *34S* & *WA*)
∞	−∞	∞	-45°	ln	∞−i×∞
10^{999}	-10^{999}	10^{999}			$\rightarrow \infty - i\,{}^{\pi}/_{4}$ (conf. by *34S* & *WA*)

[72] Following an article of *HP* about the *HP-71*, *complex* infinities should be treated in polar notation (see http://hparchive.com/Journals/HPJ-1984-07.pdf, p. 27 left for the reasons).

Input[72] Re(x)	Im(x)	r(x)	φ(x)	Op.	Output for ℂ lit
0.	∞	∞	90°	ln	∞+i×∞
	10^{999}	10^{999}			$\to \infty + i\,\pi/2$ (conf. by *34S* & *WA*)
0.	−∞	∞	−90°	ln	∞−i×∞
	-10^{999}	10^{999}			$\to \infty - i\,\pi/2$ (confirm. by *34S* & *WA*)
−∞	∞	∞	135°	ln	∞+i×∞
-10^{999}	10^{999}	10^{999}			$\to \infty + i\,3\pi/4$ (conf. by *34S* & *WA*)
−∞	−∞	∞	−135°	ln	∞−i×∞
-10^{999}	-10^{999}	10^{999}			$\to \infty - i\,3\pi/4$ (conf. by *34S* & *WA*)
0.	0.	0.	0.	ln	NaN+i×NaN
10^{-999}	0.	10^{-999}	0.		$\to -\infty + i \times 0$
0.	—	—			−∞
0.	∞	∞	90°	e^x	NaN+i×NaN
	10^{999}	10^{999}			-0.926 663+i×0.375 893 (*34S*: NaN+i×NaN)
0.	−∞	∞	−90°	e^x	NaN+i×NaN
	-10^{999}	10^{999}			-0.926 663−i×0.375 893 (*34S*: NaN+i×NaN)
−∞	0	∞	180°	e^x	0.+i×0.
-10^{999}	10^{-999}	10^{999}			0.+i×0.
−∞		∞			NaN+i×NaN
−∞	∞	∞	135°	e^x	NaN+i×NaN
-10^{999}	10^{999}	10^{999}			0.+i×0.
−∞	−∞	∞	−135°	e^x	NaN+i×NaN
-10^{999}	-10^{999}	10^{999}			0.+i×0.

DRAFT