Maximum numeric output for *data type* …

- **1:** $\pm 10^{1001}$ with full 1001-digit precision (though you can see and read a maximum of 294 digits "only" of such a number (cf. SHOW on p. 74).
- **2, 3, 8, and 9:** The maxima are as specified for input above. Any (partial) result exceeding $-10^{RANGE} < x < 10^{RANGE}$ will be assessed as −∞ or +∞, respectively, and will then be treated according to the actual system settings at display time; if SPCRES is clear, an overflow error will be thrown – else >-∞ or <∞ will be displayed. On the other hand, any result within $-10^{-RANGE} < x < 10^{-RANGE}$ will be displayed as >0.
- **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
- **10:** The maxima are as specified for input above.

Special Results (as of 2020-04-05)

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). 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.

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	

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

For dyadic functions, we combined the respective tables:

Input y	x	Op.(s)	Output for ℝ lit
∞	arbitrary $x \neq -\infty$	+	∞ [68]
−∞	arbitrary $x \neq \infty$	+	−∞ [68]
−∞	∞	+	NaN [68]
∞	arbitrary $x \neq \infty$	−	∞ [69]
−∞	arbitrary $x \neq -\infty$	−	−∞ [69]
−∞	−∞	−	NaN
∞	∞	−	NaN
∞	arbitrary $x > 0$	×	∞ [68]
−∞	arbitrary $x < 0$	×	∞ [68]
∞	arbitrary $x < 0$	×	−∞ [68]
−∞	arbitrary $x > 0$	×	−∞ [68]
0 or 0.	−∞ or ∞	×	NaN [68]
$0 < y \leq \infty$	0.	/	∞
$-\infty \leq y < 0$	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 $x > 0$	y^x	∞
∞	arbitrary $x > 0$	y^x	∞
arbitrary $y \neq 0$	−∞	y^x	0.
arbitrary $y \neq 0$	∞	y^x	∞
0.	$0 < x < \infty$	$\log_x y$	−∞

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

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

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.

For ℂ lit, some particular returns of elementary transient functions operating at the edge of the complex plain at ±∞ (or returning ±∞) are listed in the table below:[70]

Input[71] Re(x)	Im(x)	r(x)	φ(x)	Op.	Output for ℂ lit
-∞	—	—		√x	∞∡90° = 0.+i×∞
-∞	0	∞	180°		
0.	∞	∞	90°	x^2	∞∡180° = -∞+i×0.
-∞	—	—		∛x	-∞
-∞	0	∞	180°		∞∡45° = ∞+i×∞ (*34S*: NaN+i×NaN)
-10^999	0	10^999	180°		1.×10^333 ∡ 60° = 5.×10^332 + i×8.660 254 037×10^332 $= 5 \times 10^{332}\left(1 + i \times \sqrt{3}\right)$
—		10^333	60°	x³	-1.×10^999 + i×0. $\rightarrow -\infty + i \times 0$
-∞	—	—		x³	-∞
-∞	0	∞	180°		-∞+i×0.
-∞	0	∞	180°	ln	-∞+i×3.141 592 65… $= \infty + i\pi$
-∞	—	—			NaN (*WA* returns ∞)
-∞	∞	∞	135°	ln	∞+i×2.356 194 49… $= \infty + i\,{}^{3\pi}/_{4}$
0.	∞	∞	90°		∞+i×1.570 796 32… $= \infty + i\,{}^{\pi}/_{2}$
∞	∞	∞	45°		∞+i×0.785 398 16… $= \infty + i\,{}^{\pi}/_{4}$

[70] Red results in the tables are considered wrong although they may concur with the *WP 34S*.

[71] 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[71] Re(x)	Im(x)	r(x)	φ(x)	Op.	Output for ℂ lit
∞	—	—		ln	∞
∞	0	∞	0°		∞+i×0.
∞	−∞	∞	−45°	ln	∞−i×0.785 398 16… $= \infty - i\,{}^{\pi}/_{4}$
0.	−∞	∞	−90°		∞−i×1.570 796 32… $= \infty - i\,{}^{\pi}/_{2}$
−∞	−∞	∞	−135°		∞−i×2.356 194 49… $= \infty - i\,{}^{3\pi}/_{4}$
0.	0.	0.	0.	ln	−∞+i×0.
0.	—	—			−∞
−∞	0	∞	180°	e^x	0.+i×0.
-10^{999}	10^{999}	10^{999}	135°	e^x	0.+i×0.
−∞	∞	∞			NaN+i×NaN
0.	∞	∞	90°	e^x	NaN+i×NaN
∞	∞	∞	45°		
∞	−∞	∞	−45°		
0.	−∞	∞	−90°		
−∞	−∞	∞	−135°	e^x	NaN+i×NaN
-10^{999}	-10^{999}	10^{999}			0.+i×0.

Computation of lg and **lb x** is derived from ln. The same applies for e^x, 10^x, and 2^x.

At the bottom line, we hope confusion is limited (and recommend keeping off ±∞ in *complex* plane).