

Subject: More mathematical functions
 From: Van Snyder

1 **1 Number**

2 TBD

3 **2 Title**

4 More mathematical functions.

5 **3 Submitted By**

6 J3

7 **4 Status**

8 For consideration.

9 **5 Basic Functionality**

10 More mathematical functions.

11 **6 Rationale**

12 Mathematical functions for complex type are occasionally needed. The only ones that are available
 13 for complex type are ABS, COS, EXP, LOG and SIN. The other mathematical functions that are
 14 provided for real type are useful in practice for complex type as well. Inverse hyperbolic functions and
 15 other functions are useful. Simple identities for complex argument exist, but it is a burden to expect
 16 users to look them up, and processors might be able to produce more efficient implementations. For
 17 inverse hyperbolic functions, there are simple identities involving square root and logarithm, but these
 18 can have substantial cancellation error for some ranges of values, so it is important to be careful in
 19 their implementation. Processors would presumably include careful intrinsic implementations of these
 20 functions.

21 **7 Estimated Impact**

22 Minor but tedious. Estimated at meeting 169 to be 4 on the JKR scale.

23 **8 Detailed Specification**

24 Provide ACOSH, ASINH, ATANH, COSH, SINH, TAN and TANH for complex type. Provide inverse hyper-
 25 bolic functions, including for complex type. In the case of TAN, specify that the real part of the
 26 argument is regarded as a value in radians.

27 **8.1 Suggested edits**

28 The following edits are proposed only for the purpose of indicating the scope of the project.

29	ACOSH(X)	Inverse hyperbolic cosine	294:25+
30	ASINH(X)	Inverse hyperbolic sine	294:26+
31	ATANH(X)	Inverse hyperbolic tangent	294:27+
32	[Editor: Add the following three items to the list in alphabetical order:]		298:16

ACOSH

ACOSH

default real

ASINH
 ATANH

ASINH
 ATANH

default real
 default real

1	[Editor: after “1” insert “, or of type complex”.]	301:10
2	13.7.3¹/₂ ACOSH (X)	301:14+
3	Description. Inverse hyperbolic cosine function.	
4	Class. Elemental function.	
5	Argument. X shall be of type real or complex.	
6	Result Characteristics. Same as X.	
7	Result Value. The result has a value equal to a processor-dependent approximation to the	
8	inverse hyperbolic cosine function of X.	
9	Example. ACOSH (1.5430806) has the value 1.0 (approximately).	
10	[Editor: after “1” insert “, or of type complex”.]	304:14
11	13.7.12¹/₂ ASINH (X)	304:18+
12	Description. Inverse hyperbolic sine function.	
13	Class. Elemental function.	
14	Argument. X shall be of type real or complex.	
15	Result Characteristics. Same as X.	
16	Result Value. The result has a value equal to a processor-dependent approximation to the	
17	inverse hyperbolic sine function of X.	
18	Example. ASINH (1.1752012) has the value 1.0 (approximately).	
19	[Editor: after “real” insert “or complex”.]	305:31
20	13.7.15¹/₂ ATANH (X)	306:13+
21	Description. Inverse hyperbolic tangent function.	
22	Class. Elemental function.	
23	Argument. X shall be of type real or complex.	
24	Result Characteristics. Same as X.	
25	Result Value. The result has a value equal to a processor-dependent approximation to the	
26	inverse hyperbolic tangent function of X.	
27	Example. ATANH (0.76159416) has the value 1.0 (approximately).	
28	[Editor: after “real” insert “or complex”.]	309:7
29	[Editor: after “real” insert “or complex”.]	352:15
30	[Editor: after “real” insert “or complex”.]	355:16
31	[Editor: “, with X ... radians” ⇒ “. If X is of type real, it is regarded as a value in radians. If X is of	355:18-19
32	type complex, its real part is regarded as a value in radians”.]	
33	[Editor: after “real” insert “or complex”.]	355:24

34 **9 History**

03-258r1, section 2.4.4.3 m166
 04-184r1 m167