P4 CR for rootn case differs from IEEE 754

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C FP Group

TS 18661-4 CR nn

Reference Document: TS 18661-4

Subject: rootn case differs from IEEE 754

Summary

IEEE 754-2008 (IEC 60559:2011) neglected to specify infinity cases for its rootn operation. TS 18661-4 added these cases. Later the IEEE 754-2019 revision also added them but with one case different: rootn(-inf, n) for even n > 0. TS 18661-4 says the result is the same as rootn(-0, -n) without a divide-by-zero floating-point exception, which TS 18661 and IEEE 754 agree is +inf. IEEE 754-2019 says the result is qNaN with an invalid exception.

The following suggested TC changes rootn in TS 18661-4 to match IEEE 754-2019.

Suggested Technical Corrigendum

In TS 18661-4, clause 7, in C.F.10.4.8, change:

— \( \text{rootn}(\pm \infty, n) \) is equivalent to \( \text{rootn}(\pm0, -n) \) for n not 0, except that the “divide-by-zero” floating-point exception is not raised.

To:

— \( \text{rootn}(+\infty, n) \) is +\( \infty \) for n > 0.
— \( \text{rootn}(-\infty, n) \) is -\( \infty \) for odd n > 0.
— \( \text{rootn}(-\infty, n) \) is qNaN and raises the “invalid” floating-point exception for even n > 0.
— \( \text{rootn}(+\infty, n) \) is +0 for n < 0.
— \( \text{rootn}(-\infty, n) \) is -0 for odd n < 0.
— \( \text{rootn}(-\infty, n) \) is qNaN and raises the “invalid” floating-point exception for even n < 0.