Exercises on Numerical Programming

Extended Precision

Find an implementation of an extended-precision data type for real numbers using two double-precision numbers. The idea here is that each extended-precision number has a high (most significant) and low (least significant) part:

\[
\begin{array}{c|c}
\text{high part (real*8)} & \text{low part (real*8)} \\
\end{array}
\]

This is of course not quite the same as quadruple precision, even though it takes the same storage. It does help, however, to perform an operation such as \(10^{20} + 10^{-20}\) without loss of precision.

Task: program the addition and multiplication operations for such a kind of extended-precision number. The output of each operation should be normalized in the sense that the high part represents the full result to the extent of double precision, e.g. the extended-precision number \((10, 10)\) becomes \((20, 0)\) when normalized.