

$$\begin{aligned}
\hat{\delta}(A, 0011) &= \delta(\hat{\delta}(A, 001), 1) \\
&= \delta(\delta(\hat{\delta}(A, 00), 1), 1) \\
&= \delta(\delta(\delta(\hat{\delta}(A, 0), 0), 1), 1) \\
&= \delta(\delta(\delta(\delta(A, 0), 0), 1), 1) \\
&= \delta(\delta(\delta(B, 0), 1), 1) \\
&= \delta(\delta(A, 1), 1) \\
&= \delta(B, 1) \\
&= A
\end{aligned}$$