The calculations in the beginning are similar to the previous case, so I will be shorter.

$$\frac{y-1}{\log y} = \frac{(y(1+\delta)-1)(1+\delta)^3}{\log y} = \frac{y-1}{\log y} + \frac{y-1}{\log y}3\delta + \frac{y\delta}{\log y} + o(\delta).$$

Troubles can arise only from the term $\frac{y\delta}{\log y}$, since the other are comparable to δ, which by definition has the absolute value smaller than the roundoff unit, i.e. it is such that $|\delta| < \frac{1}{2}2^{1-t}$.

We can write

$$\frac{y\delta}{\log y} \approx \frac{y\delta}{y-1}.$$

The minimum value that $y-1$ can assume is 1 summed the machine epsilon, so $1+2^{1-t}$. We so get

$$\max\left|\frac{y\delta}{y-1}\right| = \left|\frac{1+2^{1-t}\delta}{2^{1-t}}\right| \approx \left|\frac{\delta}{2^{1-t}}\right| \leq \frac{\frac{1}{2}2^{1-t}}{2^{1-t}} = \frac{1}{2}.$$