Recovering a signal from sampled data using the sinc reconstruction filter:

Original signal: 15 periods of a 1 Hz sinewave, plotted with fine resolution:

\[ T := 1 \quad f := \frac{1}{T} = 1 \quad \omega := \frac{2 \cdot \pi}{T} \quad F(t) := \sin(\omega \cdot t) \]

\[ T_s := 15 \cdot T \quad \Delta t := 0.01 \quad t := 0, \Delta t \ldots T_s \]

Signal digitally sampled at just over the Nyquist frequency (twice the signal frequency):

\[ f_s := 2.1 \cdot f \]

\[ \Delta t_s := \frac{1}{f_s} = 0.476 \quad N_s := \frac{T_s}{\Delta t_s} = 31.5 \quad i := 0 \ldots N_s \]

\[ t_{\text{sampled}} := i \cdot \Delta t_s \quad F_{\text{sampled}} := F(t_{\text{sampled}}) \]
Signal recreated from the sampled data using the sinc reconstruction filter:

\[
sinc(t) := \begin{cases} 
1 & \text{if } (t = 0) \\
\sin(t) / t & \text{else}
\end{cases}
\]

\[
f(t) := \sum_{i=0}^{N} F_{\text{sample}} \cdot sinc\left(\frac{\pi \cdot (t - t_{\text{sample}})}{\Delta t_s}\right)
\]

\[
N := \frac{T_s}{\Delta t} \quad i := 0 \ldots N \quad t_{\text{reconstruct}} := i \cdot \Delta t
\]

\[
F_{\text{reconstruct}} := f(t_{\text{reconstruct}})
\]

Reconstructed sampled signal compared to the original signal:

Note that the reconstructed wave matches the original signal fairly well. The match is poor only at the beginning and end of the sampling interval, where the signal is started and stopped abruptly.