Theorem 11.29 (Nyquist-Shannon Sampling Theorem) Let $g(t)$ be a signal with Fourier transform $G(f)$ that vanishes for $f \notin [-W, W]$. Then

$$g(t) = \sum_{i=-\infty}^{\infty} g\left(\frac{i}{2W}\right) \operatorname{sinc}(2Wt - i)$$

for $-\infty < t < \infty$, where

$$\operatorname{sinc}(t) = \frac{\sin(\pi t)}{\pi t}$$

called the sinc function, is defined to be 1 at $t = 0$ by continuity.

Remarks