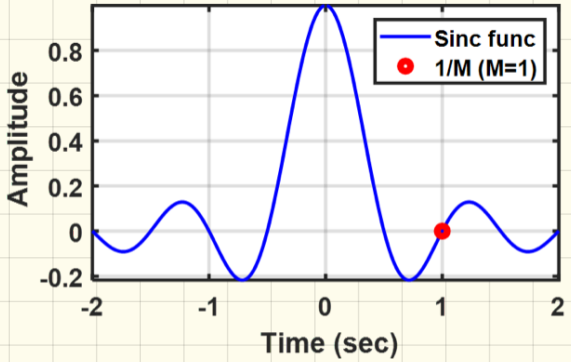
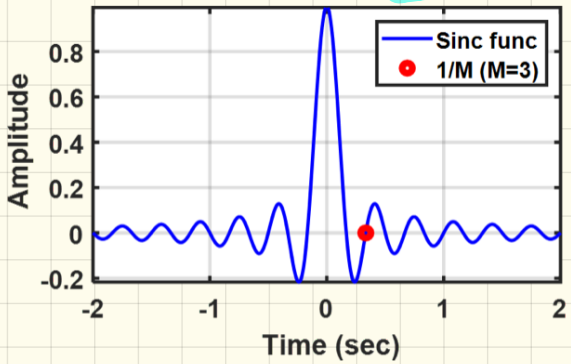
$$sinc(x) \equiv \begin{cases} 1 & for\ x = 0 \\ \dfrac{\sin 2\pi Mx}{2\pi Mx} & otherwise \end{cases}$$

L'Hopital

When $x = 0$

$\dfrac{2\pi M \cos 2\pi M}{2\pi M} = 1$





$\dfrac{\sin 2\pi M\left(\frac{1}{M}\right)}{2\pi M\left(\frac{1}{M}\right)} = \dfrac{\sin 2\pi}{2\pi} = 0$

$M \to \infty$

• locatm $\longrightarrow$ 0

Amplitude

1

$$\int_{-\infty}^{\infty} e^{\pm i2\pi at}dt = \lim_{M\to\infty}\left(\int_{-M}^{M}(cos2\pi at \pm i\, sin2\pi at)dt\right)$$

$$= \lim_{M\to\infty}\left(\int_{-M}^{M}(cos2\pi at)dt\right) = \lim_{M\to\infty} 2\frac{sin2\pi at}{2\pi a}\Big|_{0}^{M}$$

$$= \lim_{M\to\infty} 2M\frac{sin2\pi aM}{2\pi aM} = \delta(a)$$ ← why ??

$2M$ · $\frac{\sin 2\pi aM}{2\pi aM}$

$2M$: amplitude. $\frac{\sin 2\pi aM}{2\pi aM}$: sinc function.

① When $a = 0$

② When $a \neq 0$

sinc function $= M$

$\lim_{M\to\infty} M = \infty$.

$M \to \infty$

value $\to 0$.