

## The Function $\text{sinc}(x)$

The *unnormalized sinc function* is defined to be:

$$\text{sinc}(x) = \frac{\sin x}{x}.$$

This function is used in signal processing, a field which includes sound recording and radio transmission.

Use your understanding of the graphs of  $\sin(x)$  and  $\frac{1}{x}$  together with what you learned in this lecture to sketch a graph of  $\text{sinc}(x) = \sin(x) \cdot \frac{1}{x}$ .

9/9/25

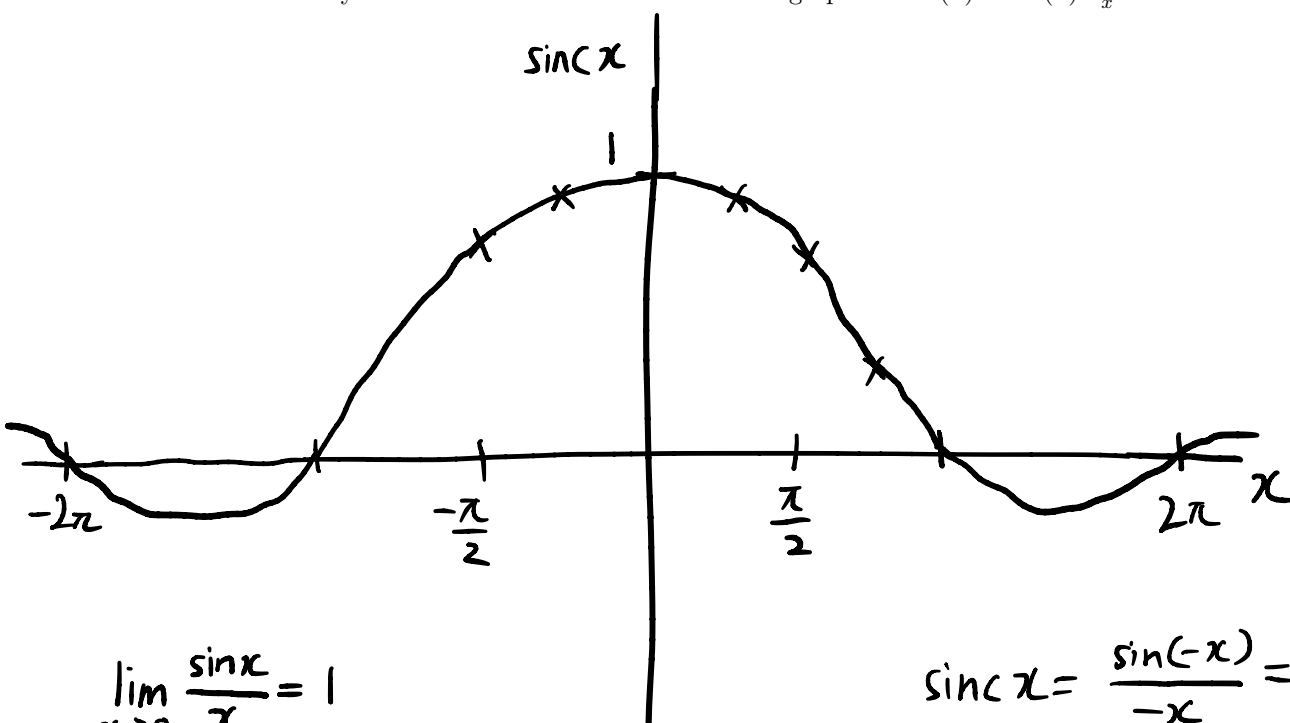
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$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

$$\text{sinc } x = \frac{\sin(-x)}{-x} = \frac{\sin x}{x}$$

$\Rightarrow \text{sinc } x$  is an even function

$$-1 \leq \sin x \leq 1$$

$$\Rightarrow -\frac{1}{x} \leq \frac{\sin x}{x} \leq \frac{1}{x}$$

When  $x = \frac{\pi}{2}$ ,  $\text{sinc } x = \frac{2}{\pi} \approx \frac{2}{3}$ ,

$$x = \frac{\pi}{4}, \quad \text{sinc } x = \frac{2\sqrt{2}}{\pi} \approx \frac{9}{10}$$

$$x = \frac{3\pi}{4}, \quad \text{sinc } x = \frac{2\sqrt{2}}{3\pi} \approx \frac{3}{10}$$

$$x = \pi, \quad \text{sinc } x = 0$$