

MATH 145 Calculus for Engineering and Science I

Recitation 8

December 15th, 2025

1. Let $f(x) = \frac{\sin x}{x}$ for $x \neq 0$ and $f(x) = 0$ for $x = 0$. Find $f'(0)$ and $f''(0)$.
2. For x, y and $x + y$ are not in the form $k\pi + \pi/2$:

$$\tan(x + y) = \frac{\tan(x) + \tan(y)}{1 - \tan x \tan y}$$

3. Show that If $n, m \in \mathbb{N}$, then

$$\int_{-\pi}^{\pi} \sin mx \cos nx \, dx = 0$$

4. Find the following limits by l'Hopital's Rule:

$$\lim_{x \rightarrow 0} \frac{e^x - 1 - x - x^2}{x^3}$$

$$\lim_{x \rightarrow \frac{\pi}{4}} (\tan x)^{\tan 2x}$$

5. Show that $e = \lim_{x \rightarrow \infty} (1 + 1/x)^x$.
6. Show that if $f(x) = \int_0^x f(t)dt$, then $f = 0$.