

Calculus — Homework 3 (Fall 2023)

1. Sketch the graph and classify the discontinuities (if any) as being removable or essential.

(a) $f(x) = |x^2 - 1|$.

(b) $f(x) = \tan(x + 1)$.

(c) $f(x) = \begin{cases} \frac{x^2 - 4}{x - 2}, & x \neq 2, \\ 0, & x = 2. \end{cases}$

(d) $f(x) = \begin{cases} \frac{x + 2}{x^2 - x - 6}, & x \neq -2, 3, \\ -\frac{1}{5}, & x = -2, 3. \end{cases}$

(e) $f(x) = \begin{cases} \sin x \cos x, & x < 0, \\ 0, & x = 0, \\ 1/x^2 & x > 0. \end{cases}$

2. Evaluate the limits.

(a) $\lim_{x \rightarrow \pi} \sin(x - \sin x)$.

(b) $\lim_{x \rightarrow 0} \sin\left(\frac{\pi}{2} \cos(\tan x)\right)$.

(c) $\lim_{x \rightarrow 0} \cos\left(\frac{\pi}{\sqrt{19 - 3 \sec(2x)}}\right)$.

(d) $\lim_{x \rightarrow 0^+} \sin\left(\frac{\pi}{2} \cos(\sqrt{x})\right)$.