

CALCULUS I REVIEW

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1. LIMITS

- (1) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 2}$
- (2) $\lim_{x \rightarrow 2^+} \sqrt{x + 7} - 2x$
- (3) $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$
- (4) $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^3 - 8}$
- (5) $\lim_{x \rightarrow 2^-} \frac{2 - x}{|2 - x|}$
- (6) $\lim_{x \rightarrow \pi^-} \ln(\sin x)$
- (7) $\lim_{x \rightarrow \infty} \frac{x^2 - 1}{x - 2}$
- (8) $\lim_{x \rightarrow -\infty} \frac{x^2 - 1}{x^5 - 2x^2 + 1}$
- (9) $\lim_{x \rightarrow \infty} \sqrt{x^2 + 4x + 1} - x$
- (10) $\lim_{x \rightarrow 1} \frac{1}{x - 1} - \frac{1}{x^2 + 4x - 5}$
- (11) $\lim_{u \rightarrow 1} \frac{\sin(u - 1)}{2u - 2}$
- (12) $\lim_{x \rightarrow -\infty} \frac{e^x + 1}{1 - x}$
- (13) $\lim_{x \rightarrow \infty} \frac{x + 1}{e^x + 1}$
- (14) $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2 + x}$
- (15) $\lim_{x \rightarrow 0^+} x^2 \ln x$
- (16) $\lim_{x \rightarrow \frac{\pi}{2}^-} (\tan x)^{\cos x}$
- (17) Let

$$f(x) = \begin{cases} \sqrt{-x} & \text{if } x < 0, \\ 3 - x & \text{if } 0 \leq x \leq 3, \\ (x - 3)^2 & \text{if } x > 3. \end{cases}$$

- (a) Evaluate each limit, if it exists:

- (i) $\lim_{x \rightarrow 0^+} f(x)$
- (ii) $\lim_{x \rightarrow 0^-} f(x)$
- (iii) $\lim_{x \rightarrow 0} f(x)$
- (iv) $\lim_{x \rightarrow 3^-} f(x)$
- (v) $\lim_{x \rightarrow 3^+} f(x)$
- (vi) $\lim_{x \rightarrow 3} f(x)$

- (b) Where is f discontinuous?
- (c) Sketch the graph of f .

- (18) Does the function

$$y = \frac{2}{1 - 3x}$$

have any vertical or horizontal asymptotes? Justify your response using limits.

- (19) Find all values of a such that f is continuous on $\mathbb{R}$:

$$f(x) = \begin{cases} x + 1 & \text{if } x \leq a, \\ x^2 & \text{if } x > a. \end{cases}$$

- (20) Recognize this limit to compute

$$\text{it: } \lim_{z \rightarrow 0} \frac{e^{\sin(\frac{\pi}{4} + z)} - e^{\frac{\sqrt{2}}{2}}}{z}.$$