

MATH 100:108 – 2019W — Practice Problems 1

A.Alperen Bulut

September 9, 2019

Problem 1. Calculate the following limits.

(a) $\lim_{x \rightarrow 3} \frac{e^{x-3} + \sin(x) + x}{x^5 + \ln(2x) + x^x}$

(b) $\lim_{x \rightarrow 5} |x - 5|$

(c) **(Final, 2016)** $\lim_{x \rightarrow 0} \frac{|x|}{x}$

(d) $\lim_{x \rightarrow 0^+} e^{1/x}$

(e) $\lim_{x \rightarrow 0^-} e^{1/x}$

(f) $\lim_{x \rightarrow -2^+} \frac{|3x|}{x + 2}$

(g) $\lim_{x \rightarrow 0} \frac{\sqrt{16 + x} - 2}{x}$

(h) $\lim_{x \rightarrow 0} \frac{\sqrt{16 + x} - 4}{x}$

Problem 2. Let

$$f(x) = \begin{cases} x^4, & \text{if } x \leq 0; \\ x, & \text{if } x > 0. \end{cases}$$

Find $\lim_{x \rightarrow 0} f(x)$. (First trying to sketch a graph might be helpful.)

Problem 3. Let

$$f(x) = \begin{cases} x - 2, & \text{if } x \leq 2; \\ \sin(\pi x) + 3, & \text{if } x > 2. \end{cases}$$

Find $\lim_{x \rightarrow 2} f(x)$. (First trying to sketch a graph might be helpful.)

Problem 4 (Final, 2014). Suppose that $8x \leq f(x) \leq x^2 + 16$ for all $x \geq 0$. Find $\lim_{x \rightarrow 4} f(x)$.

Problem 5 (Coolest ones, if you ask me). Calculate the following limits.

(a) $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 1} - x)$

(b) $\lim_{x \rightarrow \infty} (\sqrt{x^2 + x} - x)$

Problem 6 (Final, 2016). Evaluate

$$\lim_{x \rightarrow \infty} \frac{3x + 1}{\sqrt{4x^2 - 3x - 7}}.$$

Problem 7. Evaluate also, then,

$$\lim_{x \rightarrow -\infty} \frac{3x + 1}{\sqrt{4x^2 - 3x - 7}}.$$

Most of these problems have been blatantly and shamelessly stolen (and then maybe tweaked just a little bit) by A. Alperen BULUT from the textbook and the teaching materials of other instructors.

E-mail address: aabulut@math.ubc.ca

Webpage: <https://www.math.ubc.ca/~aabulut/>