Math 1A: Calculus **Instructor: Alexander Paulin**

Handout: Limits, Part I

Discussions 201, 203 // 2018-09-07

Problem 1 (Conceptual questions)**.**

(1) True or false: if the numbers $f(1), f(0.1), f(0.01), f(0.001), \ldots$ tend towards 3, then $\lim_{x\to 0} f(x) = 3$.

(2) Give an example of a function f and a number a such that the values of $f(a)$, $\lim_{x\to a^+} f(x)$, and $\lim_{x\to a^-} f(x)$ are all *different*. (You can just draw the graph of such a function.)

(3) When $\lim_{x\to a^+} f(x)$ differs from $\lim_{x\to a^-} f(x)$, what can we conclude about $\lim_{x\to a} f(x)$?

(4) Is it true that $\lim_{x\to a} f(x) = f(a)$ for any f and any a?

Problem 2 (Limit evaluation)**.** Determine whether the limit exists, and if it does, evaluate it.

(1) $\lim_{x\to 3}(x^3 + 2x - 7)$

(2) $\lim_{x\to 0} \dfrac{x^7 + x^4 + x^2}{5x^4 + x^3 + 5x}$

(3) $\lim_{x\to 0} \dfrac{x^7 + x^4 + x}{5x^4 + x^3 + 5x^2}$

(4) $\lim_{x\to 2} \dfrac{x^2 + x - 6}{x^2 - 4}$

(5) $\lim_{x\to \pi/2} \left((x - \pi/2)\cos(x)\right)$

(6) $\lim_{x\to \pi/2} \left((x - \pi/2)\cos\left(\dfrac{1}{x - \pi/2} + x^3 - 17\right)\right)$

(7) $\lim_{x\to 0} \left(\dfrac{\sqrt{2x+1}}{x} - \dfrac{1}{x}\right)$