

# MATHEMATICAL ANALYSIS

## 1ST HOMEWORK

**Problem 1.** For  $n = 1, 2, \dots$ , and  $x$  real, put

$$f_n(x) = \frac{x}{1 + nx^2}.$$

Show that  $\{f_n\}$  converges uniformly to a function  $f$ , and that the equation

$$f'(x) = \lim_{n \rightarrow \infty} f'_n(x)$$

is correct if  $x \neq 0$  but false if  $x = 0$ .

**Problem 2.** Let  $\{f_n\}$  be a sequence of continuous functions which converges uniformly to a function  $f$  on a set  $E$ . Prove that

$$\lim_{n \rightarrow \infty} f_n(x_n) = f(x)$$

for every sequence of points  $x_n \in E$  such that  $x_n \rightarrow x$ .

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