

# Assignment # 11.

Due Nov. 27, 13:00

**Problem 1.** Find

$$\lim_{x \rightarrow a^-} f(x), \quad \lim_{x \rightarrow a^+} f(x), \quad \lim_{x \rightarrow a} f(x)$$

if exist. As usual, justify your answer.

**a.**  $a = 0, \quad f(x) = \begin{cases} x^3, & \text{if } x \geq 1, \\ (x-1)^{-2}, & \text{if } 0 < x < 1, \\ |x-1|, & \text{if } x \leq 0; \end{cases}$

**b.**  $a = 1, \quad f(x) = \begin{cases} (x-1)^{-2}, & \text{if } x > 1, \\ |x-1|, & \text{if } x < 1; \end{cases}$

**c.**  $a = 3, \quad f(x) = \frac{x+3}{x-3}.$

**Problem 2.** Find

$$\lim_{x \rightarrow -\infty} f(x), \quad \lim_{x \rightarrow \infty} f(x)$$

if exist. As usual, justify your answer.

**a.**  $f(x) = \frac{x^2 + 1}{x^3 - 1},$  **b.**  $f(x) = \frac{x^4 - 1}{1 - x^2}.$

**Problem 3.** Is the following statement true or false? As usual, justify your answer.

**a.** If a function  $f$  is discontinuous at point  $a$  then so is  $f^2$ .

**b.** If a function  $f$  is discontinuous at point  $a$  and a function  $g$  is continuous at point  $a$  then  $f + g$  is discontinuous at point  $a$ .