Math 114 Practice Test 1

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Problem 1.

(a) Directly from the definition of a limit, compute with proof $\lim_{x\to -2} \frac{x}{x+4}$

(b) Directly from the definition, compute with proof $\lim_{x\to 3} \frac{2x^2-10x+12}{x-3}$.

Problem 2.

Let

$$f(x) = \begin{cases} 5 & x < -1 \\ 2 & x > -1 \end{cases}$$

(a) Directly from the definition, compute with proof $\lim_{x \to 1} f(x)$.

(b) Directly from the definition of a limit, prove that $\lim_{x \to -1} f(x)$ does not exist.

Problem 3.

Let

$$g(x) = \begin{cases} x - 3 & x < 3 \\ 2x + 1 & x > 3 \end{cases}$$

(a) Directly from the definition, compute with proof $\lim_{x \to 0} g(x)$.

(b) Directly from the definition of a limit, prove that $\lim_{x \to 3} g(x)$ does not exist.

Problem 4. (a) Directly from the definition, prove that $\lim_{x\to -4} \frac{x}{4+x} = \pm\infty$.

(b) Directly from the definition, prove that $\lim_{x\to -2} \frac{x}{(x+2)^2} = -\infty$.

Problem 5. Compute the following limits, showing each step and naming each limit law you use.

(a)

$$\lim_{x \to 4} \sqrt{x^2 - x - 3} + \frac{2}{x}$$

(b)

$$\lim_{x \to 1} \frac{x^2 + 4x - 5}{x - 1}$$