

Calculus I (Math 231) Exam 1

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Justify answers and show all work for full credit. No calculators allowed.

NAME: _____

Problem 1. *Compute these limits. For an infinite limit, write $+\infty$ or $-\infty$. Otherwise, if a limit does not exist (DNE), you must justify. Show all work!*

(a) $\lim_{x \rightarrow -5} \frac{x^2 + 9x + 20}{x + 5}$

(b) $\lim_{x \rightarrow 9^-} \frac{\sqrt{x} - 3}{x - 9}$

(c) $\lim_{x \rightarrow 8} \frac{|x - 8|}{x - 8}$

(d) $\lim_{x \rightarrow 4^-} \frac{\sqrt{x - 4}}{x + 1}$

Problem 2. Compute these limits. For an infinite limit, write $+\infty$ or $-\infty$. Otherwise, if a limit does not exist (DNE), you must justify. Show all work!

(a) $\lim_{\theta \rightarrow 0} \frac{\sin(2\theta)}{3 \tan(2\theta)}$

(b) $\lim_{\theta \rightarrow 0} \frac{\sin(5\theta)}{6\theta}$

(c) $\lim_{x \rightarrow 4} \frac{\sqrt{x+5} - 3}{x - 4}$

Problem 3. Compute these limits. For an infinite limit, write $+\infty$ or $-\infty$. Otherwise, if a limit does not exist (DNE), you must justify. Show all work!

(a) $\lim_{x \rightarrow -\infty} \frac{2x^3 - 18}{x^3 - 27}$

(b) $\lim_{x \rightarrow \infty} \left(\frac{1}{1+x} - \frac{1}{1-x} \right)$

(c) $\lim_{x \rightarrow 1^+} \left(\frac{1}{1+x} - \frac{1}{1-x} \right)$

Problem 4. Find constants a and b such that $f(x)$ is everywhere continuous.

$$f(x) = \begin{cases} 2x^3 - 1 & x \leq -1 \\ ax + b & -1 < x < 0 \\ \frac{\sin \sqrt{x}}{\sqrt{x}} & x \geq 0 \end{cases}$$