Math 113 Exam #1 Practice Problems

1. Find the vertical asymptotes (if any) of the functions

$$g(x) = 1 + \frac{2}{x}, \qquad h(x) = \frac{4x}{4 - x^2}$$

What are the domains of g and h?

2. Evaluate

(a) $\lim_{x \to 2} \dfrac{x^2 - 4}{x^2 - 5x + 6}$ (b) $\lim_{x \to -2} \dfrac{|x + 2|}{x + 2}$ (c) $\lim_{x \to \infty} \dfrac{4x^3 + 2x - 4}{4x^2 - 5x + 6x^3}$

3. Evaluate

$$\lim_{x \to 6} \frac{x^2 - 36}{3x^2 - 16x - 12}$$

4. Evaluate

$$\lim_{x \to \infty} \frac{\sqrt[3]{x^2 - 3x + 29034}}{7x - 9999}$$

5. Let

$$f(x) = \begin{cases} cx^2 - 3 & \text{if } x \leq 2 \\ cx + 2 & \text{if } x > 2 \end{cases}$$

f is continuous provided c equals what value?

6. Is the function f defined below continuous? If not, where is it discontinuous?

$$f(x) = \begin{cases} \sqrt{-x} & \text{if } x < 0 \\ 3 - x & \text{if } 0 \leq x < 3 \\ (3 - x)^2 & \text{if } x \geq 3 \end{cases}$$

7. Let $f(x)$ be continuous on the closed interval $[-3, 6]$. If $f(-3) = -1$ and $f(6) = 3$, then which of the following must be true?

(a) $f(0) = 0$

(b) $f'(c) = \frac{4}{9}$ for at least one c between -3 and 6

(c) $-1 \leq f(x) \leq 3$ for all x between -3 and 6.

(d) $f(c) = 1$ for at least one c between -3 and 6.

(e) $f(c) = 0$ for at least one c between -1 and 3.

8. Find the one-sided limit

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

9. Let

$$f(x) = x^3 + 2x^2 + 1.$$

Is f differentiable at -2? If so, what is $f'(-2)$?

10. Let

$$f(x) = |x - 2|.$$

Is f differentiable at 2? If so, what is $f'(2)$?