

Math 2250 Exam #1 Practice Problems

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

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

What are the domains of g and h ?

2. Evaluate

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

3. Evaluate

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

4. Evaluate

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

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) $-1 \leq f(x) \leq 3$ for all x between -3 and 6 .
- (c) $f(c) = 1$ for at least one c between -3 and 6 .
- (d) $f(c) = 0$ for at least one c between -1 and 3 .

8. Find the one-sided limit

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

9. Let $f(x) = |x - 2|$. Does

$$\lim_{h \rightarrow 0} \frac{f(2 + h) - f(2)}{h}$$

exist? If so, what is this limit?

10. Evaluate

$$\lim_{x \rightarrow \infty} \frac{\sqrt{4x^2 - 8x + 7}}{17x + 12}$$

11. Let

$$f(x) = \begin{cases} \frac{x-2}{x^2-4} & \text{for } x \neq 2 \\ a & \text{for } x = 2 \end{cases}$$

If $f(x)$ is continuous at $x = 2$, then find the value of a .

12. Are there any solutions to the equation $\cos x = x$?

13. Determine the following limits, if they exist

(a) $\lim_{x \rightarrow -1} \frac{x^2 - 2x + 1}{x - 1}$

(b) $\lim_{x \rightarrow 1^-} \frac{x^2 + 2x + 1}{x - 1}$

14. For each of the following, either evaluate the limit or explain why it doesn't exist.

(a)

$$\lim_{x \rightarrow 16} \frac{4 - \sqrt{x}}{x - 16}$$

(b)

$$\lim_{x \rightarrow -\infty} \frac{6x^2}{\sqrt{7x^4 + 9}}$$

(c)

$$\lim_{x \rightarrow -2} \frac{x^2 + x - 2}{x^2 + 4x + 4}$$

15. (a) At which numbers is the function $h(x) = \cos\left(\frac{x}{1-x^2}\right)$ continuous? Justify your answer.

(b) What is $\lim_{x \rightarrow 0} h(x)$? Explain your reasoning.