

# HOMEWORK 1 - MATH 112

DUE DATE: Tuesday, January 23

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Read each problem **very carefully** before starting to solve it. Four out of the eight problems will be chosen at random and graded. Each problem graded is worth 3 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Let  $f(x) = \frac{2}{x}$  and  $g(x) = \sqrt{x-1}$ . Find a formula for the composite  $(g \circ f)(x)$ . Then find the domain of  $g \circ f$ .

2. Find the inverse function of  $f(x) = \frac{2x-1}{3+x}$ .

3. (a) Let  $f(x) = \begin{cases} \frac{1}{3}x - 2, & \text{if } x \leq 3 \\ -2x + 5, & \text{if } x > 3 \end{cases}$

Find  $\lim_{x \rightarrow 3^-} f(x)$  and  $\lim_{x \rightarrow 3^+} f(x)$ . Does  $\lim_{x \rightarrow 3} f(x)$  exist?

(b) Let  $f(x) = \begin{cases} x^2 - 5x + 1, & \text{if } x < -1 \\ 2x + 7, & \text{if } x > -1 \end{cases}$

Find  $\lim_{x \rightarrow -1^-} f(x)$  and  $\lim_{x \rightarrow -1^+} f(x)$ . Does  $\lim_{x \rightarrow -1} f(x)$  exist?

4. Find the following limits:

(a)  $\lim_{x \rightarrow 2} (2x - 3)$

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

(c)  $\lim_{x \rightarrow 4} \sqrt{x + 4}$

5. Find the following limits:

(a)  $\lim_{x \rightarrow -1} \frac{2x^2 - x - 3}{x + 1}$

(b)  $\lim_{x \rightarrow 2} \frac{2-x}{x^2-4}$

6. Let  $f(x) = \begin{cases} 3 + x, & \text{if } x \leq 2 \\ x^2 + 1, & \text{if } x > 2 \end{cases}$ . Test  $f$  for continuity at  $x = 2$  **in detail**.

7. Find the value of the constant  $a$  so that the function

$$f(x) = \begin{cases} x^3 + 1, & \text{if } x \leq 2 \\ ax^2 + 7, & \text{if } x > 2 \end{cases}$$

be continuous at  $x = 2$ .

8. Look at Example 2 on page 63 in your book. Discuss the continuity of the functions  $f(x) = \frac{x^2-9}{x+3}$  and  $g(x) = \frac{1}{x+7}$ .