HOMEWORK 1 - MATH 112 DUE DATE: Monday, September 17 INSTRUCTOR: George Voutsadakis

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 $f(x) = \begin{cases} \frac{1}{3}x 2, & \text{if } x \le 3\\ -2x + 5, & \text{if } x > 3 \end{cases}$ Find $\lim_{x \to 3^{-}} f(x)$ and $\lim_{x \to 3^{+}} f(x)$. Does $\lim_{x \to 3} f(x)$ exist?
 - (b) Let $f(x) = \begin{cases} x^2 5x + 1, & \text{if } x < -1 \\ 2x + 7, & \text{if } x > -1 \\ \text{Find } \lim_{x \to -1^-} f(x) \text{ and } \lim_{x \to -1^+} f(x). \text{ Does } \lim_{x \to -1} f(x) \text{ exist?} \end{cases}$

4. Find the following limits:

- (a) $\lim_{x\to 2} (2x-3)$
- (b) $\lim_{x \to -2} \frac{x^2 1}{2x}$
- (c) $\lim_{x\to 4} \sqrt{x+4}$
- 5. Find the following limits:
 - (a) $\lim_{x \to -1} \frac{2x^2 x 3}{x + 1}$ (b) $\lim_{x \to 2} \frac{2 - x}{x^2 - 4}$
- 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

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

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 $g(x) = \frac{1}{x+7}$.