HOMEWORK 1 - MATH 112

DUE DATE: Monday, January 16

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Read each problem very carefully before starting to solve it. One part of each problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show 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 $\lim_{x\to 3^-} f(x)$ and $\lim_{x\to 3^+} f(x)$. Does $\lim_{x\to 3} f(x)$ exist?

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

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

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

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