King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 101 (151) Sec 07 - Quiz II

Name: ID: Serial No.:

1. Let $f(x) = \dfrac{x}{x+1}$, $x_0 = 1$, $L = \dfrac{1}{2}$ and $\epsilon = \frac{1}{4}$

   (a) Find an open interval about $x_0 = 1$ such that the inequality $|f(x) - L| < \epsilon$ holds.

   (b) Find a number $\delta > 0$, such that for all x satisfying $0 < |x - x_0| < \delta$, the inequality $|f(x) - L| < \epsilon$ holds.

2. Consider the function

$$f(x) = \begin{cases} x + x^2 \sin \dfrac{1}{x} & \text{if} \quad x \neq 0 \\ b + 1 & \text{if} \quad x = 0, \end{cases}$$

Find all value(s) of b, if exists that makes the function continuous everywhere.

3. Let $f(x) = \dfrac{\ln(2x+1)}{x^2 - 4}$

(a) When $f(x)$ is continuous?

(b) Find all vertical asymptotes of $f(x)$. Justify your answer using limits.

4. Using the Intermediate-value theroem to show that the equation $x^x = 3x - 1$ has a positive solution.

5. Find the horizontal asymptotes of the curve $y = \dfrac{x^3 - 3x + 1}{|x - 1|^3 + 9}$. Justify your answer using limits.

6. Sketch the graph of a function f that satisfies the following conditions

   (a) $\lim_{x \to -\infty} f(x) = 0$

   (b) $\lim_{x \to 0^-} f(x) = 1$

   (c) $\lim_{x \to 0^+} f(x) = \infty$

   (d) $\lim_{x \to 2} f(x) = -\infty$

   (e) f has a removable discontinuity at $x = 4$

   (f) $f(4) = 1$

   (g) $\lim_{x \to \infty} f(x) = \infty$