MTH101: Practice Questions for
Lecture No. 11: Limit: Rigorous Approach
Lecture No.12: Continuity

Choose the correct option for the following questions:

1) If $\lim_{x \to a} g(x) = L$ exists, then it means that for any $\varepsilon > 0$ $g(x)$ is in the interval ____.

I. $(a-L, a+L)$
II. $(a-\delta, a+\delta)$
III. $(L-\delta, L+\delta)$
IV. $(L-\varepsilon, L+\varepsilon)$

2) Using epsilon-delta definition, $\lim_{x \to 4} f(x) = 6$ can be written as ______.

I. $|f(x)-6| < \varepsilon$ whenever $0 < |x-4| < \delta$
II. $|f(x)-4| < \varepsilon$ whenever $0 < |x-6| < \delta$
III. $|x-6| < \varepsilon$ whenever $0 < |f(x)-4| < \delta$
IV. $|f(x)-x| < \varepsilon$ whenever $0 < |6-4| < \delta$

3) Using epsilon-delta definition, our task is to find δ which will work for any ____.

I. $\varepsilon < 0$
II. $\varepsilon > 0$
III. $\varepsilon \geq 0$
IV. $\varepsilon \leq 0$

4) Using epsilon-delta definition, $\lim_{x \to 1} f(x) = 2$ can be written as ______.

I. $|x-2| < \varepsilon$ whenever $0 < |f(x)-1| < \delta$

II. $\left| f(x)-x \right| < \varepsilon$ whenever $0 < \left| 2-1 \right| < \delta$

III. $\left| f(x)-2 \right| < \varepsilon$ whenever $0 < \left| x-1 \right| < \delta$

IV. $\left| f(x)-2 \right| < \varepsilon$ whenever $0 < \left| x-2 \right| < \delta$

5) Which of the following must hold in the definition of limit of a function?

I. ε greater than zero

II. δ greater than zero

III. both ε and δ greater than zero

IV. none of these

Question 6:

Show that $h(x) = 2x^2 - 5x + 3$ is a continuous function for all real numbers.

Question 7:

Discuss the continuity of the following function at $x = 4$

$$f(x) = \begin{cases} -2x+8 & for\ x \le 4 \\ \frac{1}{2}x - 2 & for\ x > 4 \end{cases}.$$

Question 8:

Check the continuity of the following function at $x = 4$

$$g(x) = \begin{cases} x+4 & if\ \ x < 1 \\ 2 & if\ 1 \le x < 4 \\ -5+x & if\ x \ge 4 \end{cases}$$

Question 9:

Check the continuity of the following function at $x = 3$

$$f(\mathrm{x}) = \left| x+3 \right|$$

Question 10:

State why the following function fails to be continuous at *x=3*.

$$f(\mathrm{x}) = \begin{cases} \dfrac{9-x^2}{3-x} & if \quad x \neq 3 \\ 4 & if \quad x = 3 \end{cases}$$