PRACTICE SHEET

Limit :-

1) If $f(x) = \dfrac{x^2-3x+2}{x-2}$ show that the limit of $f(x)$ at $x=2$ exists.

2) Find

a) $\lim\limits_{x\to 3} \dfrac{x^2-6x+9}{x-3}$.

b) $\lim\limits_{x\to 3} x^3-9x^2+x$

c) $\lim\limits_{x\to 3} \dfrac{x^2-2x}{x+1}$.

d) $\lim\limits_{x\to \infty} \dfrac{3^x-3^{-x}}{3^x+3^{-x}}$.

e) $\lim\limits_{x\to +\infty} \left(\sqrt{x^2-3x}-x\right)$.

3) A real function is defined by. $f(x) = \dfrac{x}{1-x}$.

a) Find $\lim\limits_{x\to 1^+} f(x)$ and $\lim\limits_{x\to 1^-} f(x)$.

b) Find $\lim\limits_{x\to \infty} f(x)$ and $\lim\limits_{x\to -\infty} f(x)$.

4) A function is defined as follows :-

$$f(x) = \begin{cases} x^2+1 & \text{when } x>0. \\ 1 & \text{when } x=0. \\ 1+x & \text{when } x<0. \end{cases}$$

Find the value of $\lim\limits_{x\to 0} f(x)$.

(5) A function $f(x)$ is defined as

$$f(x) = \begin{cases} 1, & \text{when } x>0. \\ 0, & \text{when } x=0 \\ -1. & \text{when } x<0. \end{cases}$$

Show that $\lim_{x\to 0} f(x)$ does not exist.

(6) A function $f(x)$ is defined as follows :-

$$f(x) = \begin{cases} e^{\frac{-|x|}{2}} & \text{when } -1<x<0. \\ x^2 & \text{when } 0\leqslant x<2. \end{cases}$$

Discuss the existence of $\lim_{x\to 0} f(x)$.

(7) A function $f(x)$ is defined as follows :-

$$f(x) = \begin{cases} 2-3x & \text{when } x<0 \\ 3x-2 & \text{when } x\geqslant 0. \end{cases}$$

Find the value of $\lim_{x\to 0^+} f(x)$ and $\lim_{x\to 0^-} f(x)$.

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Exercise 3.6 → 7-45 (Odd Numbers)

9 Find a) $\lim_{x \to +\infty} (1 + 2x - 3x^5)$.

b) $\lim_{x \to +\infty} \dfrac{5x^2 - 4x}{2x^2 + 3}$.

c) $\lim_{t \to +\infty} \dfrac{6 - t^3}{7t^3 + 3}$.

d) $\lim_{x \to -\infty} \dfrac{\sqrt{5x^2 - 2}}{x + 3}$.

e) $\lim_{x \to +\infty} \left(\sqrt{x^2 - 3x} - x\right)$

f) $\lim_{x \to +\infty} \left(\sqrt{x^2 + 3} - x\right)$

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Continuity :-

① Determine whether the fallowing functions are continuous at $x=2$.

a) $f(x) = \dfrac{x^2-4}{x-2}$.

b) $g(x) = \begin{cases} \dfrac{x^2-4}{x-2} & , x \neq 2. \\ 3 & x = 2. \end{cases}$

c) $h(x) = \begin{cases} \dfrac{x^2-4}{x-2} & ; \quad x \neq 2 \\ 4 & ; \quad x = 2. \end{cases}$

d) $g(x) = \begin{cases} 5-x & , \quad -1 \leq x \leq 2. \\ x^2-1 & , \quad 2 < x < 3. \end{cases}$

e) $f(x) = \begin{cases} x+2 , & x < 2 \\ x^2-1 , & x \geq 2. \end{cases}$

5 Find values of x, if any, at which f is not continuous (x is only real value).

a) $f(x) = 5x^4 - 3x + 7$.

b) $f(x) = \sqrt[3]{x-8}$

c) $f(x) = \dfrac{x+2}{x^2-4}$

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

4. Find a value of the constant k, if possible, that will make the function continuous everywhere.

a) $$f(x) = \begin{cases} 7x-2, & x \leq 1. \\ kx^2 & x > 1. \end{cases}$$