

Week - In - Review 3: Sections 3.1 - 3.4(part)

1. Compute the following limits. If the limit does not exist, support your answer.

$$(a) \lim_{x \rightarrow -1} \frac{x^2 - x - 2}{x^2 + 9x + 8}$$

$$(b) \lim_{x \rightarrow 2} \frac{|3x - 6|}{x - 2}$$

$$(c) \lim_{x \rightarrow 3^+} f(x), \quad f(x) = \begin{cases} \sqrt{x^2 + 16} & , x \leq 3 \\ x^3 - 10 & , x > 3 \end{cases}$$

$$(d) \lim_{x \rightarrow 0} \frac{(4+x)^{-1} - 4^{-1}}{x}$$

$$(e) \lim_{x \rightarrow \infty} \frac{x^2 + 4x - 5}{4x^2 - x - 3}$$

$$(f) \lim_{x \rightarrow -\infty} \frac{2x^3 - 4x^2 + 1}{2x^4 + 3x^2 + 3x + 5}$$

$$(g) \lim_{x \rightarrow -\infty} \sqrt{4x^2 + 7x + 1} + 2x$$

$$(h) \lim_{x \rightarrow \infty} \frac{\sqrt{3 + 2x + 7x^2}}{3x + 5}$$

(i) $\lim_{x \rightarrow 0} \frac{\cos(2x) - 1}{\tan(4x)}$.

(j) $\lim_{x \rightarrow 0} \frac{\sin^2(6x)}{5x^2}$

2. Is there a number a such that $\lim_{x \rightarrow -2} \frac{3x^2 + ax + a + 3}{x^2 + x - 2}$ exists? If so, find a and the value of the limit.

3. Find all holes and vertical asymptote(s) for the graph of $g(x) = \frac{(x^2 + 4x)(x - 8)}{x^2(x^2 + 2x - 8)}$ and determine the behavior of the function near the vertical asymptote(s).

4. Find all horizontal and vertical asymptotes for $f(x) = \frac{x^2 + 3x - 4}{4x^2 - x - 3}$.

5. Given $f(x) = \begin{cases} 3x - 4, & x > 2 \\ 0, & x = 2 \\ x, & -1 < x < 2 \\ -2 - x, & x \leq -1 \end{cases}$, use the 3-step definition of continuity to show whether or not the function is continuous at $x = -1$ and $x = 2$.

6. Does $f(x) = \frac{x^4 - 16}{x - 2}$ have a removable discontinuity at $x = 2$? If so, find a function g that agrees with f for $x \neq a$ and is continuous at $x = a$.

7. Find all values of A and B that will make the function $f(x) = \begin{cases} x^2 + 5, & x < -1 \\ Ax^2 + Bx + 2, & -1 \leq x \leq 2 \\ -9x, & x > 2 \end{cases}$ continuous for all real numbers.