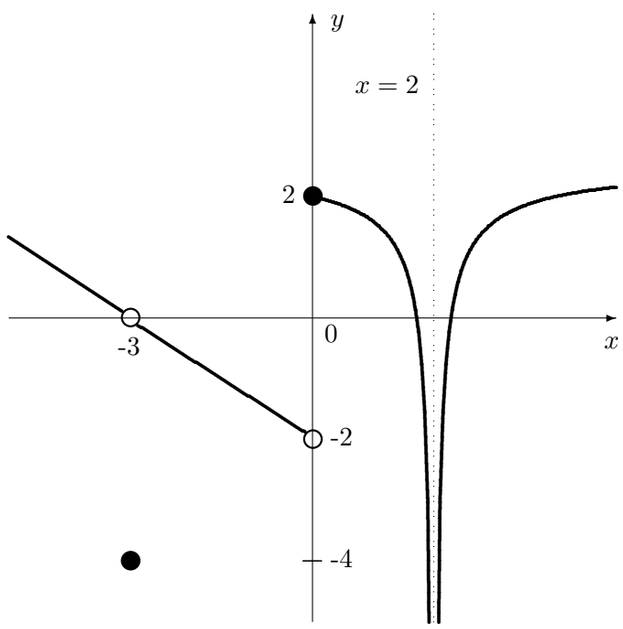
MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

TEST 1 **MATHEMATICS 1000-006** OCTOBER 8TH, 2024

Name	**MUN Number**

[12] 1. Use the graph of $y = f(x)$ below to determine each of the following. Label the limits as ∞ or $-\infty$ where appropriate. If the limit does not exist or the value of the function is undefined, indicate this.



(a) $f(-3) =$

(b) $\lim_{x \to -3^-} f(x) =$

(c) $\lim_{x \to -3^+} f(x) =$

(d) $\lim_{x \to -3} f(x) =$

(e) $f(2) =$

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

(g) $\lim_{x \to 2^+} f(x) =$

(h) $\lim_{x \to 2} f(x) =$

(i) $f(0) =$

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

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

(ℓ) $\lim_{x \to 0} f(x) =$

[16] 2. Determine each of the following limits. If a limit does not exist, explain why.

(a) $\lim_{x \to 0} \dfrac{\sin^2(5x)}{x^2}$

(b) $\lim_{x \to -3} \left[\dfrac{6}{x^2 - 9} - \dfrac{1}{x^2 + 5x + 6} \right]$

(c) $\lim_{x \to 2} \dfrac{3x - 6}{3 - \sqrt{5x - 1}}$

[4] 3. Identify any horizontal asymptotes to the graph of $f(x) = \dfrac{6x^2 + 7}{x(1 - 3x)}$.

[8] 4. Given the function

$$f(x) = \begin{cases} kx + 7, & \text{for } x < 3 \\ 2\sqrt{k + 5}, & \text{for } x = 3 \\ x + k^2, & \text{for } x > 3 \end{cases}$$

for some constant k, determine each of the following.

(a) All values of k for which $\lim\limits_{x \to 3} f(x)$ exists.

(b) All values of k for which $f(x)$ is continuous at $x = 3$.

(c) All values of k for which $f(x)$ has a removable discontinuity at $x = 3$.