1. (25 pts) Use the graph above to answer the following. Assume that the only part of the curve outside this view is as indicated by the arrows.

(a) (12 pts) Find the following limits using the graph of \( f(x) \) above, writing \(+\infty, -\infty\), and “Does Not Exist” as appropriate.

i. \( \lim_{x \to -6} f(x) = \)

ii. \( \lim_{x \to -3^-} f(x) = \)

iii. \( \lim_{x \to -1} f(x) = \)

iv. \( \lim_{x \to -4} f(x) = \)

v. \( \lim_{x \to 0} f(x) = \)

vi. \( \lim_{x \to 1^+} f(x) = \)

(b) (4 pts) List the \( x \)-values for each point of discontinuity of \( f(x) \) on the interval \((-2, 3)\) and classify the type of discontinuity, if any.

(c) (5 pts) List all subintervals of \([-3, 3]\) on which \( f(x) \) is continuous.

(d) (4 pts) List the \( x \)-values for each point on the interval \((-2, 3)\) where \( f(x) \) is not differentiable, if any.
2. (20 pts) Evaluate each limit using $+\infty$, $-\infty$ and “Does Not Exist” where appropriate. Use only algebraic methods; tables will not suffice.

(a) (7 pts) $\lim_{h \to 0} \frac{\sqrt{5h} + 4 - 2}{h}$

(b) (7 pts) $\lim_{x \to 0} \frac{\sin^2(3x)}{8x^2}$

(c) (6 pts) $\lim_{x \to 1} \frac{x^2 - x}{|x - 1|}$

3. (9 pts) Using the definition of continuity, find the value of $a$ and $b$ that makes $f(x)$ continuous at $x = 1$ for $f(x)$:

$$f(x) = \begin{cases} 
ax^2 + bx & \text{if } x < 1, \\
3 & \text{if } x = 1 \\
2a - bx & \text{if } x > 1
\end{cases}$$
4. (12 pts) Using a theorem from class, show that there exists at least one \( x \in [0, 1] \) that satisfies the equation \( 3^x = 2 - 2x \). Justify your answer in complete sentences.

5. (7 pts) Given \( f(x) = \sqrt{x + 1} \), find the largest \( \delta > 0 \) satisfying the condition that \( |f(x) - 2| < 1 \) whenever \( 0 < |x - 3| < \delta \).

6. (7 pts) Using a theorem from class, show that \( \lim_{x \to 0} 4x^4 \sin(1/x^3) = 0 \).
7. (13 pts) Using the appropriate limits, find the horizontal and vertical asymptotes of \( f(x) = \frac{x^2 + 2x + 1}{x^2 - x - 2} \).

8. (7 pts) Using the limit definition, find the slope of the graph of \( y = x^2 + 1 \) at the point (2, 5).

Honor Pledge: I have neither given nor received aid on this exam. Signature: ___________________________