No calculators are allowed!

PART I

Part I consists of eight questions. Clearly write your answer (only) in the space provided after each question. Show all of your work for full credit!

Part 1 problems 1-4 are 6 points each, 5-8 are 7 points each.

Evaluate the following limits.

Question 1

\[
\lim_{x \to 2} \frac{x^2 + 2x - 8}{x - 2}
\]

Answer: ....................

Question 2

\[
\lim_{x \to 0} \frac{\sin(3x)}{\sin(7x)}
\]

Answer: .....................
Question 3

\[ \lim_{x \to \infty} \frac{x + 1 + \frac{1}{x}}{x^2 + 1} \]

Answer: ..................

Question 4

\[ \lim_{x \to 0^-} \frac{x}{|x|} \] Note this is a left-sided limit.

Answer: ..................

Question 5

\[ \lim_{x \to 2} \sec(\ln(x^2 - 3)) \]

Answer: ..................

Question 6

\[ \lim_{x \to 0} \frac{1}{x^2} \]

Answer: .........................
Question 7
\[ \lim_{x \to 0} \frac{\tan(x)}{2x} = \]

Answer: .........................

Question 8
\[ \lim_{x \to \infty} \frac{x^2 + x + 1}{100x} = \]

Answer: .........................
Part II consists of 2 problems. You must show correct reasons to get full credit. Displaying only the final answer (even if correct) without the relevant steps will not get full credit.

Problem 1 (24 points)

Given the graph of the function $y = f(x)$ below find:

1. $\lim_{x \to -1^-} f(x) =$
2. $\lim_{x \to -1^+} f(x) =$
3. $\lim_{x \to -1} f(x) =$
4. $\lim_{x \to 2^-} f(x) =$
5. $\lim_{x \to 2^+} f(x) =$
6. $\lim_{x \to 2} f(x) =$
7. $\lim_{x \to \infty} f(x) =$
8. State all intervals on which $f(x)$ is continuous.
Problem 2 (24 points)

Find the equation of the tangent line, at $x = 0$, to the following functions:

1. $f(x) = x^2 + 1$

2. $g(x) = \sin(x)$