

Name: _____

Group #: _____

Evaluate the following limits using appropriate methods:

1. $\lim_{x \rightarrow 0^+} \tan^{-1}(\ln x)$

2. $\lim_{x \rightarrow \infty} \frac{1 - e^x}{1 + e^x}$

3. $\lim_{x \rightarrow 0} \frac{3 \cos(x) \sin(4x)}{2x}$

4. Given there exists a function $h(x)$ such that $2x^3 + 5 \leq h(x) \leq x^4 + 5$ for all x near 2,
find $\lim_{x \rightarrow 2} \frac{h(x) + 3}{4}$

5. Using the conditions of continuity, determine if $f(x)$ is continuous at $x = 0$ and $x = 1$. If $f(x)$ is discontinuous at either point, indicate the type of discontinuity.

$$f(x) = \begin{cases} 1 - x & : x < 0 \\ e^x & : 0 \leq x \leq 1 \\ x^2 + 2 & : x > 1 \end{cases}$$

6. Find a value of k for which $g(x)$ is continuous everywhere:

$$g(x) = \begin{cases} \frac{x^2 - 9}{x - 3} & : x \neq 3 \\ kx & : x = 3 \end{cases}$$

7. Consider the function $f(x)$ that satisfies the following conditions:

- $f(x)$ is continuous for all x except $x = -4$, $x = 0$, and $x = 4$.
- $f(0)$ is undefined
- $\lim_{x \rightarrow 0} f(x) = 3$
- $\lim_{x \rightarrow -4^-} f(x) = -\infty$ $\lim_{x \rightarrow -4^+} f(x) = \infty$
- $\lim_{x \rightarrow 4^-} f(x) = \infty$ $\lim_{x \rightarrow 4^+} f(x) = -\infty$
- $\lim_{x \rightarrow -\infty} f(x) = 2$ $\lim_{x \rightarrow \infty} f(x) = 2$

(a) State the equation(s) for any horizontal asymptote(s) on the graph $f(x)$.

(b) State the equation(s) for any vertical asymptote(s) on the graph $f(x)$.

(c) At what x -value(s) does $f(x)$ have any discontinuities? What type are they? If there are none, state that.

(d) Sketch a possible graph of $f(x)$.

