1. Find the domain of each function.
   (a) (5 points) \( g(x) = \frac{1}{2 + e^x} \)

   (b) (5 points) \( u(v) = \frac{1}{1 - e^v} \)

2. (10 points) Find a formula for the inverse of the function.

   \[ z(y) = \frac{1 + e^y}{1 - e^y} \]
3. Find the exact value of the expression.
   (a) (5 points) $\log_3 \frac{1}{9}$

   (b) (5 points) $e^{2\ln 4}$

4. (10 points) Eliminate the parameter to find a Cartesian equation of the curve.

   \[ x(t) = 1 + 3t \]
   \[ y(t) = 3t - 5 \]

5. (5 points) Given that a population of rabbits doubles in size every week, if there were 100 rabbits today, what will be the average rate of increase in population over the next two weeks (from $t = 0$ to $t = 2$)? (Specify units.)
6. For the following piecewise function, state the value of each quantity, if it exists. If it does not exist, explain why.

\[ f(x) = \begin{cases} 
\frac{1}{x+1} & \text{if } x < -1 \\
\sqrt{x+1} & \text{if } -1 \leq x \leq 1 \\
(x-1)^2 & \text{if } x > 1 
\end{cases} \]

(a) (5 points) \( \lim_{x \to -1^-} f(x) \)

(b) (5 points) \( \lim_{x \to -1^+} f(x) \)

(c) (5 points) \( \lim_{x \to 1} f(x) \)

7. Evaluate the limit, if it exists.

(a) (10 points) \( \lim_{t \to 0} \sin(\pi t) \sin(\pi /t) \)
(b) (10 points) \[ \lim_{x \to 1} \frac{x^3 + 2}{x^3 + x^2 - 1} \]

8. (10 points) For what value of the constant \( c \) is the function \( f \) continuous on \((-\infty, \infty)\)?

\[ f(x) = \begin{cases} 
  cx^2 - 2x & \text{if } x < 3, \\
  x^3 - cx & \text{if } x \geq 3 
\end{cases} \]

9. (10 points) Find an equation of the line tangent to the hyperbola \( y = 3/x \) at \( x = 3 \).

10. **Bonus:** (5 Points) Suppose you know that \( \lim_{h \to 0} e^h \) is identical to \( \lim_{t \to 0} 1 + t \), use this, and the definition of the derivative, to evaluate \( f'(x) \) for \( f(x) = e^x \).