

Name: _____

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page. **SHOW ALL YOUR WORK.**
WRITE NEATLY AND LARGE. CIRCLE FINAL ANSWER.

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 the each quantity, if it exists. If it does not exist, explain why.

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

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

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

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

7. Evaluate the limit, if it exists.

(a) (10 points) $\lim_{t \rightarrow 0} \sin(\pi t) \sin(\pi/t)$

(b) (10 points) $\lim_{x \rightarrow -\infty} \frac{x^3 + 2}{x^3 + x^2 - 1}$

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 $\lim_{h \rightarrow 0} e^h$ is identical to $\lim_{t \rightarrow 0} 1 + t$, use this, and the definition of the derivative, to evaluate $f'(x)$ for $f(x) = e^x$.