1. Express the given quantity as a single logarithm.
   (a) (5 points) \( a \ln x - b \ln y \)

   (b) (5 points) \( \ln(\sin(x)) - \ln(\cos(x)) \)

2. (10 points) Find a formula for the inverse of the function.
   \[ f(x) = \sqrt{1 - 3x} \]
3. (10 points) Solve the equation for $x$.

$$e^{2x+3} - 8 = 0$$

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

\[
\begin{align*}
  x &= 3 \cos(\theta) \\
  y &= 2 \sin(\theta)
\end{align*}
\]

5. (5 points) Say we throw a ball into the air with an initial velocity of 30 m/s. We can give the height of the ball by the function $h(t) = 30t - 9t^2$. Determine the instantaneous velocity by using its definition. Verify $v(0) = 30$. 
6. For the following piecewise function, state the value of the each quantity, if it exists. If it does not exist, explain why.

\[ f(x) = \begin{cases} 
2 - x & x < -1 \\
e^x & -1 \leq x \leq 1 \\
(x - 1)^2 & x > 1 
\end{cases} \]

(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) \( \lim_{x \to 3} \frac{x^2 - 5x + 6}{x - 3} \)
(b) (10 points) \[ \lim_{s \to \infty} \frac{s^4 + 2}{s^5 + s^3 - 1} \]

8. (10 points) Use the Intermediate Value Theorem to show that \( f(x) = x^2 \) achieves the value 2.

9. (10 points) Use the definition of the derivative to determine \( f'(a) \) given the following function.

\[ f(t) = 1 - t^2 \]

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 \( f(x) = e^x \).