Directions: Please answer the following questions and make sure your answer are legible. You must show your work to receive credit for your answers. You may not use a calculator (or any other technology) on this quiz. Good Luck.

1. (11 points) Solve the following equations.
   (a) $\log_3(x - 4) + \log_3(x + 4) = 2$  
      $\log_3((x-4)(x+4)) = 2$  
      $3^2 = (x-4)(x+4)$  
      $9 = x^2 - 16$  
      $0 = x^2 - 25$  
      $x = 5$ or $x = -5$  
      $\text{Sol} \ x = 5$

   (b) $\ln(\ln(x)) = 3$  
      $e^3 = \ln(x)$  
      $e^{e^3} = x$

   (6.4 # 15)  
   (6.4 # 22)

More Questions on Reverse Side
2. (7 points) Solve the inequality \( \frac{1 - \ln(x)}{x^2} < 0 \), give your answer in interval notation.

\[ \frac{1 - \ln(x)}{x^2} < 0 \]

\( \text{Domain:} \quad x \neq 0 \]

\( x > 0 \)

\( x = 0 \)

\( x < 0 \)

\( \ln(x) = 1 \rightarrow e^1 = x \)

\( x = e \)

\( f(x) = \frac{1 - \ln(x)}{x^2} \)

\( f(\frac{1}{e}) = \frac{1 - \ln(\frac{1}{e})}{\left(\frac{1}{e}\right)^2} = \frac{1 - (-1)}{\frac{1}{e^2}} = e^2 \)

\( f(e) = \frac{1 - \ln(e)}{e^2} = \frac{1 - 1}{e^2} = 0 \)

\( \text{Sign Diagram} \)

\( 0 \) on 1 side

\( \text{I have to put my test points inside a log, I better pull powers of e} \)

\( \text{Solution:} \quad (e, \infty) \)

3. (7 points) For \( f(x) = \ln(x - 1) + 6 \)

(a) Find \( f^{-1}(x) \).

(b) Find the domain of \( f^{-1} \).

(c) Find the range of \( f^{-1} \).

\( f^{-1}(x) = \ln(y - 1) + 6 \)

\( \ln(y - 1) = x - 6 \)

\( e^{x-6} = y - 1 \)

\( e^{x-6} + 1 = y \)

\( f^{-1}(x) = e^{x-6} + 1 \)

(Domain \( f^{-1} \))

all \( x \) \( < 1 \)

(Domain \( f \))

\( (-\infty, 1) \)

(Extra Questions # 13)

(1, \infty)