Test 3 **Name: _____**

Score: _____

- MUST SHOW WORK TO GET FULL CREDIT (NO WORK = NO CREDIT, PARTIAL WORK = PARTIAL CREDIT).
- SIMPLIFY ALL ANSWERS.

1. (7 points) $f(x) = \frac{x-6}{x}$ and $g(x) = x^2 + 9$. Find $(f \circ g)(-2)$ and $(g \circ f)(-2)$. Write the answers as fractions or whole numbers.

2. (8 points)

For $f(x) = \frac{x-4}{x+7}$ and $g(x) = \frac{x+2}{x-3}$, find the following composite functions and state the domain of each.

a. f o g **b.** g o f

3. (8 points) The function $f(x) = 3x - 1$ is one-to-one.

a) Find the inverse of *f*.

b) Graph f, f^{-1} and $y = x$ on the same coordinate axes. Be sure to show the symmetry. Also be sure to plot a few key points on each graph.

4. (7 points)

Determine whether the function given by the table is linear, exponential, or neither. If the function is linear, find a linear function that models the data; if it is exponential, find an exponential function that models the data.

x	f(x)
-1	$\frac{6}{5}$
0	6
1	30
2	150
3	750

5. (7 points) Find the exact solution of $2 \bullet 10^{2-x} = 13$

6. (8 points)

The ideal body weight W for men (in kilograms) as a function of height h (in inches) is given by the following function.

$$W(h) = 49 + 2.3(h - 61)$$

(a) What is the ideal weight of a 6-foot male?

Round to the nearest tenth

(b) Express the height h as a function of weight W.

(c) What is the height of a male who is at his ideal weight of 80 kilograms?

Round to the nearest whole number

7. (7 points)

Write the expression as a sum and/or difference of logarithms. Express powers as factors.

$$\ln \frac{2x\sqrt{1+7x}}{(x-8)^5}, \quad x > 8$$

8. (8 points) Graph the function below (including the horizontal asymptote). Determine the domain, range and horizontal asymptote.

$$g(x) = -1 + 2^{x+3}$$

x	$g(x)$
-4	
-3	
-2	
-1	
0	

Try to NOT use calculator and leave the answers as fractions.

9. (8 points)

Write the expression as a single logarithm. Express powers as factors.

$$\ln\left(\frac{x}{x-3}\right) + \ln\left(\frac{x+3}{x}\right) - \ln\left(x^2 - 9\right)$$

10 . (8 points)

Solve the following exponential equation. Express irrational solutions in exact form and as a decimal rounded to three decimal places.

$$5^{1-9x} = 4^{x}$$

11. (8 points)

The atmospheric pressure p on a balloon or an aircraft decreases with increasing height. This pressure, measured in millimeters of mercury, is related to the height h (in kilometers) above sea level by the formula $p = 760\, e^{-0.145h}$.

Find the height of an aircraft if the atmospheric pressure is 331 millimeters of mercury.

Round to two decimal places.

12. (8 points)

The population of a certain country in 1995 was 280 million people. In addition, the population of the country was growing at a rate of 1.2% per year. Assuming that this growth rate continues, the model $P(t) = 280(1.012)^{t-1995}$ represents the population P (in millions of people) in year t.

According to this model, when will the population of the country reach

399 million people?

13. (8 points)

Solve the given system of equations.

$$\begin{cases} x - 2y + 3z = 11 \\ 2x + y + z = 2 \\ -3x + 2y - 2z = -14 \end{cases}$$