> Answer all questions below. Every question is worth the same number of points. You may use the available space for work, but must write ALL answers on the answer sheet.
> No cell phones, calculators, or notes are allowed during the exam. These rules will be strictly enforced.

Name: _____ Number: _____

True or False: For #1-8 decide whether the statement is true or false. Write the entire word "True" or the entire word word "False." Worth $\frac{1}{2}$ point each.

1. $\left(\dfrac{x}{y}\right)^n = \dfrac{x^n}{y^n}$

2. $\sqrt[n]{x+y} = \sqrt[n]{x} + \sqrt[n]{y}$

3. $(xy)^n = x^n y^n$

4. $\sqrt[n]{\dfrac{x}{y}} = \dfrac{\sqrt[n]{x}}{\sqrt[n]{y}}$

5. $\log_{10}(x) + \log_{10}(y) = \log_{10}(x+y)$

6. $\log_{10}(x) + \log_{10}(y) = \log_{10}(xy)$

7. $\sqrt[n]{xy} = \sqrt[n]{x}\,\sqrt[n]{y}$

8. $(x+y)^n = x^n + y^n$

Rational Functions

9. Completely factor the numerator and the denominator of the rational function

$$\frac{x^3 - 3x^2 + 2x - 6}{3x - 3}$$

10. Find the x-intercepts of the graph of the rational function $\dfrac{3(x-1)(x-3)}{x+2}$.

11. Find the vertical asymptotes of the rational function $\dfrac{3(x-1)(x+2)}{(x-4)(x+5)}$.

12. Calculate the end behavior of $\dfrac{x-2}{2(x-2)(x+4)}$. That is, find and simplify the equation of the function that the graph looks like to the far left and far right.

Implied Domain: Write you answers as sets, using the correct notation.

13. What is the implied domain of $f(x) = \log_{19}(x)$?

14. What is the implied domain of $g(x) = \dfrac{(x+5)}{x(x-4)}$?

15. What is the implied domain of $h(x) = 4^x$?

Translating: Logarithms ⇔ Exponentials

16. Write $\log_4(x+1) = \frac{1}{2}$ as an exponential equation.

17. Write $\pi^{3x^2} = 42$ as a logarithmic equation.

Rewriting Logarithms

18. Rewrite $\log_6(x) - \log_6(y) + \log_6(z)$ as a single logarithm.

19. Rewrite $\log_{12}(\frac{x^2 y}{z})$ so that the only logarithms that appear are $\log_{12}(x)$, $\log_{12}(y)$ and $\log_{12}(z)$.

20. Rewrite $\log_4(x)$ using logarithms with base 10.

21. What is the smallest integer less than $\log_{10}(1025)$?

Solving Equations

22. Solve for x: $\log_2(10x) - \log_2(x-1) = 14$

23. Solve for x: $e^x + 7 = 3e^x$

Applications of Logarithms and Exponentials

24. Suppose you accidentally open a canister of plutonium in your living room and 256 units of radiation leaks out. If every year, there is half as much radiation as there was the year before, how many units of radiation will there be after t years?

Algebra

25. Write $\dfrac{(a^4)^3}{a^2}$ as a single power of a.

26. Evaluate $f(4)$ given that $f(x) = \begin{cases} x^2 + 1 & : x \in [0, \infty) \\ 0 & : x \in (-\infty, 0) \end{cases}$

Graphs: Graph the following functions, and label all x- and y- intercepts, horizontal asymptotes, and vertical asymptotes as indicated.

27. (4 points) Graph $f(x) = \dfrac{3(x-3)(x+2)}{x(x+4)}$. Label any x- and y-intercepts, vertical asymptotes and horizontal asymptotes.

28. (2 points) Graph $h(x) = 4^x$. Label any x- and y-intercepts.

29. (2 points) Graph $g(x) = \log_4(x)$. Label any x- and y-intercepts.

30. (2 points) Graph $k(x) = 6^{-x} + 4$. Label any x- and y-intercepts, vertical or horizontal asymptotes.

31. (2 points) Graph $l(x) = \log_5(x - 1)$. Label any x- and y-intercepts and horizontal or vertical asymptotes.