NAME:

1. [3] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let b be a non-negative number, n be a positive integer, and x be a real number.

   T   F $b^{-2} = b^{\frac{1}{2}}$

   T   F $\sqrt[n]{x} = x^{\frac{1}{n}}$

   T   F $\sqrt{b+x} = \sqrt{b} + \sqrt{x}$

   T   F $\log_b 1 = 0$

   T   F $\log 8v^3 = 3\log 8v$ for all $v > 0$

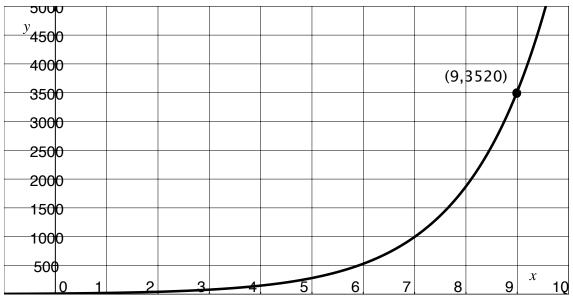   T   F $\log(\log 10) = 0$

   Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

2. [4] Solve for r and simplify given:

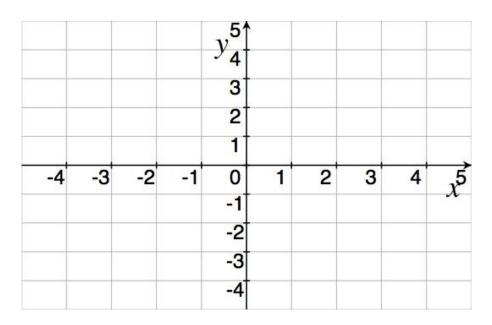$$\frac{1}{\frac{1}{r} + \frac{1}{s}} = t$$

3. Cyrano Jones gives one tribble to Uhura in the hopes to boost his sales. It turns out that tribbles are born pregnant and once fed they give birth. Dr. Spock noticed this phenomenon and began to track the population of tribbles when Uhura showed him her new family of twelve tribbles at 0800. The data is plotted below where the horizontal axis is recording the number of hours since 0800 and the vertical axis is recording the number of tribbles on the Enterprise.

(a) [3] Use the graph to estimate when there were 2000 tribbles on the Enterprise.

(b) [2] Is the above a graph of a function? Why or why not?

(c) [2] Reread the above discription. What is the initial population that Dr. Spock recorded?

(d) [5] Given that the population of tribbles is well approximated by an exponential function, use the data point on the graph to find the rule to describe the population at time x.

4. Let f be the *function* defined by

$$f(x) = \begin{cases} x^{\frac{1}{3}} & x \le 0 \\ \log_3 x & 0 < x \end{cases}$$

(a) [3] Graph f.

(b) [2] Find all possible input(s) so that $f(x) = 0$.

5. [4] Simplify the following:

$$\frac{(4y^{-2}\sqrt{x})^{\frac{3}{2}}}{x^{\frac{3}{4}}(\sqrt[3]{y8})^{-1}}$$

6. [7] Given that $\log_3 x = 5.3$ and $\log_3 y = 2.1$ find

$$\log_3 \frac{x}{3y} \qquad\qquad\qquad\qquad \log_3 y^{100}$$

7. [5] Find all x that satisfy the following:

$$\log_7(x + 5) = 2 + \log_7(x - 1)$$

8. [5] Suppose the ratio of carbon-14 to carbon-12 in a mummified cat is 64% of the corresponding ratio for living organisms. About how long ago did the cat die? Recall that the half-life of carbon-14 is 5730 years.

9. [5] James T. Kirk is in this course and would like to know if it is still possible to earn a 2.5 now that he's taken two exams. He has looked at the gradebook on catalyst and has computed the averages listed below.

Assuming James' work does not drastically change in the remaining 3 weeks and his averages remain about the same, find what grade he needs to get on the final to receive a 2.5 in the course. In case you don't remember, the weights specified in the syllabus and the function f that takes your class percentage x and returns your score on a 4. scale are also provided below.

	weight	Paul's ave
Mini-Quizzes (top score)	5%	100%
WeBWork assignments	10%	21%
Handwritten assignments	15%	32%
Quizzes	15%	89%
2 Midterms	30%	100%
Final	25%	

$$f(x) = \begin{cases} 4.0 & \text{if } 95 < x \\ .1x - 5.5 & \text{if } 62 \le x \le 95 \\ 0 & \text{if } x < 62 \end{cases}$$