

NAME: This is a sample exam to be used for practice only. This is *not* a template for the exam that will be given in class. Many of the questions on the exam will look quite different than those appearing here.

1. TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F.

Let  $x$  and  $y$  be positive numbers.

T F  $x^2x^3 = x^6$

T F  $\log(x + y) = \log(x) \cdot \log(y)$

T F  $\log\left(\frac{x}{y}\right) = \log(x) - \log(y)$

T F  $\frac{\log x}{\log y} = \frac{x}{y}$

T F  $\log_2 5x^7 = 7 \log_2 5x$

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

T F For all numbers  $z$ ,  $\sqrt{z^2} = z$

LONG ANSWERS: Show all your work and circle your final answer. Correct answers will *not* get credit without supporting work.

2. Given  $-x = \frac{2xy}{2y - 1}$ , solve for  $y$ .

3. [2] Provide the definition of the function log.

4. [4] Assume  $b, x, y > 0$ , simplify the following:

$$\frac{(b^x)^{x-1}}{b^{-x}}$$

$$\frac{\sqrt[3]{x^2}(y^2)^{\frac{3}{2}}}{x^{\frac{2}{3}}y^2}$$

$$2 - \log_5(25z)$$

$$\log_2 \frac{1}{4} + 2$$

5. [3] Find  $x$  in the following:

$$2^{4x-1} = 3^{1-x}$$

$$5^x = 2$$

6. Each function  $f$  below has an inverse. Find a formula for the inverse function  $f^{-1}$ .

$$f(x) = 4x^{\frac{3}{7}} - 1$$

$$f(x) = 3 \cdot 2^x + 4$$

7. Write the given expression as a single logarithm term.

$$2 \ln 2x - 3(\ln x^2 + \ln x)$$

$$3 - \log_6(36y)$$

8. [4] Solve for  $x$ :

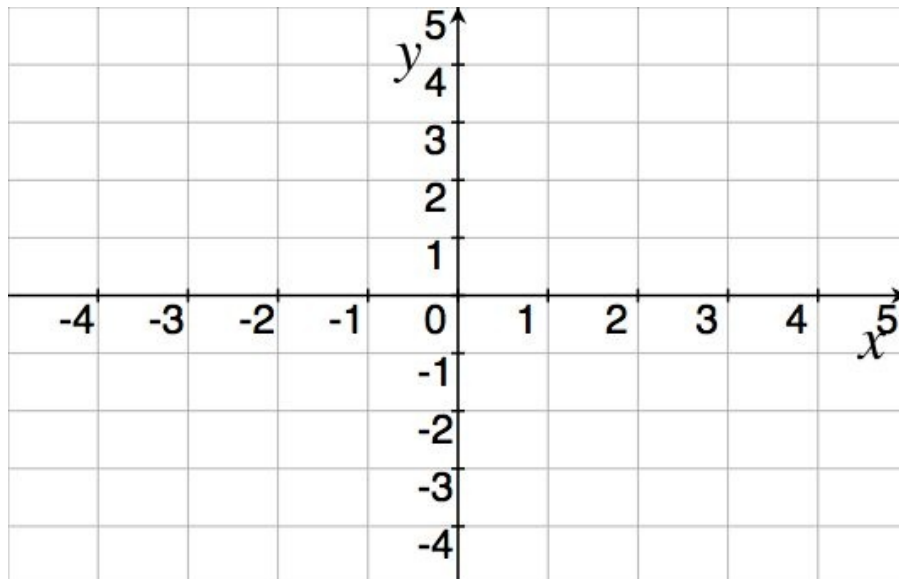
$$\log(x - 16) = 2 - \log(x - 1)$$

$$4^x - 3 \cdot 2^x = 10$$

9. Let  $h(x) = \log_2 x$  and  $f(x) = \log_2(x + 3) + 1$ .

(a) List the transformations needed to transform the graph of  $h$  to the graph of  $f$ .

(b) Graph  $f$ .



(c) Find the inverse function to  $f$ .

10. Find the distance between the zero of  $\log_2 x$  and the point  $(-2, 3)$ .

11. A sound with intensity  $x$  has  $10 \log \frac{x}{I_0}$  decibels,  
where  $I_0 = 10^{-12}$  watts per square meter ( $\text{W}/\text{m}^2$ ).

(a) [2] (§4.5 #39) France passed a law limiting iPods and other MP3 players to a maximum possible volume of 100 decibels. Find the maximum intensity (in  $\text{W}/\text{m}^2$ ) an iPod is legally allowed to output in France.

(b) [3] (§4.5 #40) Normal conversation has a sound level of about 65 decibels. How many more times intense than normal conversation is the sound an iPod operating at the French maximum of 100 decibels?

12. At current growth rates, the Earth's population is doubling about every 69 years. If this growth rate were to continue, about how many years will it take for the Earth's population to become one-fourth larger than the current level?

13. Pay Day Loans can give you a 10% loan on \$250 for up to 45 days (the actual rate is 15% and doesn't jump down to 10% until \$500, but for the purposes of this problem, assume that you know someone at Pay Day Loans and they are giving you a "deal" with 10%) . At the end of that 45 days you will have to pay off both the principal and the 10% interest on the principal. If you are unable to pay this amount at the end of the 45 days one option is to take out another loan to cover the new amount of money that you owe.

(a) If you need a loan for \$250 on Jan. 1st of 2010 but don't have access to cash until Jan 1st of 2011, you might choose to go to Pay Day Loans and "renew" the loan every 45 days until the end of the year. If you choose to do this, how much money will you owe on Jan 1st 2011?

(b) What is the effective annual interest rate of the plan above?