

NAME:

1. [4] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let  $x$  and  $y$  be non-zero real numbers.

T F  $\frac{1}{\frac{1}{2}a} = \frac{2}{a}$

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

T F  $\log_3 x = \frac{\log x}{\log 3}$

T F  $(x + 3)^2 = x^2 + 9$

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

T F The graph of  $\log_3 x$  is increasing from  $(0, \infty)$

T F  $\log(100x) = 2 + \log x$

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

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

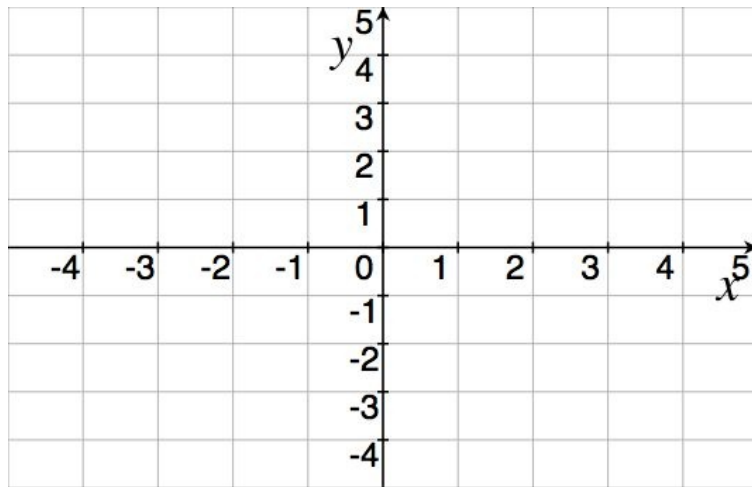
2. [3] (Exponent Wks #4) Find all  $x$  so that:

$$3x^{-2} + 1 = 6$$

3. Let the piece-wise defined function  $f$  be defined by:  $f(x) = \begin{cases} -3^x & \text{if } x < 1 \\ x - 5 & \text{if } 1 \leq x < 3 \end{cases}$

(a) [4] (§2.2 #49 & 4.1 #13)  
Graph the function  $f$ .

(b) [2] (§4.1 #25) What is the domain of  $f$ ?



(c) [2] Does  $f$  have an inverse? Why or why not?

4. [3] (§4.1 #43) Let  $g(x) = 2^x$ . Find the *difference quotient* of  $g$  at 1. Do *not* simplify. That is find:

$$\frac{g(1+h) - g(1)}{h}$$

(and do *not* simplify!)

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

(§4.4 #28)  $x^2 3^x = 3^x$

(§4.4 #19)  $5^x = 4^{x+1}$

(§4.2 #31)  $\log_x 16 = 4$

(Quiz 4 #3)  $\log_5 x + \log_5(x-1) = \log_5(4x)$

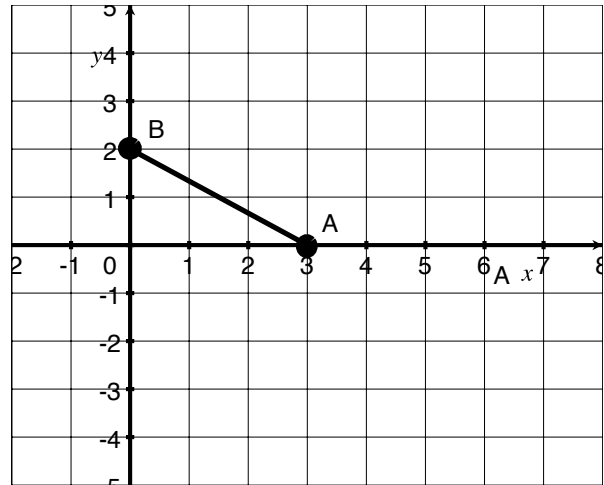
6. [3 each] Use the Laws of Logarithms to combine the expressions and simplify.

(lecture)  $\log_6 4 + \log_6 9$

(Practice Exam #7)  $2 - \log_6(36y)$

7. Consider the points  $A$  and  $B$  on the graph.

(a) [2] (§1.8 #3) Find the length of the line segment that connects  $A$  and  $B$ .



(b) [3] (§1.8 #83) Find the equation of the circle centered at  $A$  that passes through  $B$ .

8. (Lecture) On Monday two people were infected with the Tyrant virus and became zombies. The next day six people were infected.

(a) [2] Assuming the growth continues exponentially, how many people are infected by Friday?

(b) [3] Assuming the growth continues exponentially, how long until the continental U.S. is overrun? (Note the population of the U.S. is approximately 280,000,000.)

9. (§4.1 #83) Suppose you are offered a job that lasts one month. You are to be very well paid but the wages are given to you in a nonstandard manner. On the first day of the month you make two cents. On the second day of the month you make 4 cents. On the third day you are given 8 cents. In general, the wages on your  $x^{\text{th}}$  day are twice what you received on the previous day.

(a) [2] Find a function that describes how much you get paid on the  $x^{\text{th}}$  day.

(b) [1] If you took this job at the start of November and worked everyday of the month, how much would you be given for your last day of work? (There are 30 days in November.)

(c) [1] Would you rather have the above pay system or be given a million dollars at the end of the month? Justify your answer.