

## Mth 30, Homework 8 on sections 4.5, 4.6

Due by Mon, Mar 30.

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Please use lots of space and explain your answers, showing clearly any work you had to do. Each question is worth 3 points.

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### Section 4.5 Logarithmic Properties

- (1) Expand as much as possible and simplify:  $\log_3 \left( \frac{x^2 y^5}{81} \right)$
- (2) Find the exact value of:  $\log_7 \left( \frac{49}{\sqrt{7}} \right)$
- (3) Combine into a single logarithm and evaluate:  $\log(6) + \log(50) - \log(3)$
- (4) Use the change of base formula to express  $\log_3(90)$  using the natural logarithm (with base  $e$ ). Then use your calculator to evaluate it correct to 4 decimal places. Since  $3^4 = 81$  your answer should be a bit bigger than 4.
- (5) If  $\log_b(x) = 18$  and  $\log_b(y) = 2$  then find:
- (a)  $\log_b(xy)$
  - (b)  $\log_b(x/y)$
  - (c)  $\log_b(y^5)$
  - (d)  $\log_x(b)$

(Hint: Use the properties of logs such as the product and quotient rules. Can you see why the answer to (a) is 20?)

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### Section 4.6 Exponential and Logarithmic Equations

- (6) Solve the exponential equation

$$3 \cdot 2^x = 30$$

and give the solution in terms of logs and then, using the change of base formula, as a decimal.

(Hint: first divide both sides by 3. Then convert to logarithmic form ...)

- (7) Solve the exponential equation

$$4 \cdot e^x = 100$$

and give the solution in terms of logs and as a decimal.

(8) Solve the exponential equation:  $4 \cdot 2^{3x+1} = 16^{2x+2}$

(One way: take  $\log_2$  of both sides and use properties of logs. Second way: write each side as a power of 2 and use that  $2^x$  is one-to-one, meaning that if  $2^a = 2^b$  then  $a = b$ .)

(9) Solve the logarithmic equation:  $5 + \log_2(3x - 1) = 8$

(10) Solve the logarithmic equation:  $\log_2(3x + 1) = \log_2(x + 9)$

(Hint: use that  $\log_b(x)$  is one-to-one so that if  $\log_b(x) = \log_b(y)$  then  $x = y$ .)

(11) Solve the logarithmic equation:  $\ln(x - 6) = \ln(2x - 11)$

(Check your answer works - logs only take positive inputs.)

(12) Solve :  $\log_4(3) + \log_4(x - 1) = \log_4(x + 7)$

(Combine the logs on the left into a single log using the product rule for logs.)

(13) Solve :  $2 + \log_3(x) = \log_3(3x + 2)$

(Hint: write 2 as  $\log_3(\text{something})$ .)

(14) Solve :  $\log_3(x) + \log_3(x - 6) = 3$

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If you're stuck on a question:

- Ask me about it after class.
- Come to my office hours: Mon 4:30 - 5:30, Wed 4:30 - 5:30 in CP 317.
- Go to the Math Tutorial Lab in person in CP 303 or online.