Mth 30, Homework 7 on sections 4.5, 4.6

Due by Wed, Apr 2 or the following class.

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

Section 4.5 Logarithmic Properties

(1) Expand as much as possible and simplify: $\log_3\left(\frac{x^2y^5}{81}\right)$

(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?)

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 $\log_3$(something).)

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

If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes or section in the textbook.
- Ask me about it after class.
- Come to my office hours: Mon 2:00 - 3:00, Wed 2:00 - 3:00 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.