Homework 12

(due April 1)
Math 130 *Kovitz* 2020

1. Find
   (a) $\log_4 64$
   (b) $\log_{64} 4$
   (c) $\log_{64}(1/4)$
   (d) $\log_{\frac{1}{4}} 64$
   (e) $\log_4 \left(\dfrac{\sqrt{2}}{16} \right)$

2. (a) Graph
   $$y = \log_4 x.$$
   Plot all intercepts and the designated points on the graph where $x = \sqrt{2}$, $x = 1/2$, $x = \frac{1}{16}$, $y = 0$, $y = -1$, $y = 1/2$, and $y = 1.5$. Label each of these points with its coordinates.
   Designate the asymptote and label it with its equation or description.
   In what quadrants does the graph of $\log_4 x$ lie? Find the domain and range. Is this a function? Is it one-to-one? Is it odd? even? Does it have any of the four usual symmetries? Is it increasing or decreasing? What is its concavity?
   (b) Does it have the same shape as the graph of $y = \log_2 x$? Or is it an expansion or contraction of $\log_2 x$?
   (c) At how many points does this graph meet the graph of $y = x$? Determine by inspecting the two graphs.
   Find the exact coordinates of any points of intersection.
   (d) Would the graph of $y = 3 - \log_4(x + 1)$ have the same shape as $y = \log_4 x$?
   If so, make a list of transformations (including one reflection) that would produce $y = 3 - \log_4(x + 1)$ from $y = \log_4 x$. No need to graph anything.

3. Solve for x:
   $$\log_4 x - \log_4(2x - 1) = 1/2.$$
   Check your solutions in the original equation.

4. Solve for x:
   $$\log_4(x + 1) - \log_4(x - 1) = -1/2 + \log_4 3.$$
   Check your solutions in the original equation to determine if they are valid.

Problems 5 through 9 follow on the next page.

5. Solve for x.

$$\log_4(3-x) - 2\log_4 x = 1.$$

Check your solutions in the original equation.

6. Approximate the logarithm, using the properties of logarithms, given $\log_b 2 \approx 0.24$.

   (a) $\log_b 8$

   (b) $\log_b \sqrt{2}$

   (c) $\log_2 b$

7. Use the appropriate rules of logarithms to simplify to an exact real number, but do not use a calculator.

   (a) i. $\log_8 16 - \log_8 2$

   ii. $\log_{25} 37.5 + \log_{25} \frac{2}{3}$

   iii. $\log_6 4 + 2\log_6 3$

   iv. $\log_4 14 + \log_4 \frac{1}{7}$

   v. $\log_2 \sqrt[3]{16\sqrt{2}}$

   (b) i. $\log_5 \left(0.04\sqrt{5}\right)$

   ii. $\log_4 \left(.5\sqrt[4]{2}\right)^2$

8. With a calculator, approximate $\log_6 120$ to 5 places after the decimal point.

9. (a) Find $\log_2 A$, given that $\log_8 A = \pi$.

   (b) Find $\log_{\frac{1}{3}} A$, given that $\log_3 A = .2$.