

SOLUTIONS - ASSIGNMENT #5
943-DW FALL 2010

(Q1) (a) $\log_9 x = 3$ (b) $\log_{12} 144 = x - 3$ (c) $\log_x 243 = 5$
 $x = 9^3$ $x = \log_{12} 144 + 3$ $x^5 = 243$

$= 2 + 3$
 $= \boxed{5}$

$x = \sqrt[5]{243}$
 $= \boxed{3}$

(d) $\log_x 5 = \frac{1}{2}$
 $x^{1/2} = 5$
 $x = 5^2 = \boxed{25}$

(Q2) (a) $\log_5 \left(\frac{7}{a}\right) = \boxed{\log_5 7 - \log_5 a}$ (b) $\log_3 \sqrt{27} = \frac{1}{2} \log_3 27$
 $= \frac{1}{2} (3) = \boxed{\frac{3}{2}}$

(c) $\log_6 \frac{5}{36} = \log_6 5 - \log_6 36$
 $= \boxed{\log_6 5 - 2}$

(d) $\log_6 \sqrt{72}$
 $= \log_6 \sqrt{6 \cdot 6 \cdot 2}$
 $= \frac{1}{2} \log_6 (6 \cdot 6 \cdot 2)$
 $= \frac{1}{2} [\log_6 6^2 + \log_6 2]$
 $= \frac{1}{2} [2 + \log_6 2]$
 $= \boxed{1 + \frac{1}{2} \log_6 2}$

(e) $\log(10000x^3)$
 $= \log(10000) + \log x^3$
 $= \boxed{4 + 3 \log x}$

(f) $\log_3 (9^2 \times 6^3)$
 $= \log_3 (3^4 \cdot 2^3 \cdot 3^3)$
 $= \log_3 3^4 + \log_3 2^3 + \log_3 3^3$
 $= 4 + 3 \log_3 2 + 3 = \boxed{7 + 3 \log_3 2}$

(Q3)

(a) $\log_3 y = \frac{1}{2} \log_3 7 + \frac{1}{2} \log_3 x$
 $\log_3 y = \log_3 \sqrt{7} + \log_3 \sqrt{x}$
 $\log_3 y = \log_3 \sqrt{7x}$
 $\boxed{y = \sqrt{7x}}$

(b) $\log_7 y = 2 \log_7 5 + 2 \log_7 x + 2$
 $\log_7 y = \log_7 5^2 + \log_7 x^2 + 2$
 $\log_7 y = \log_7 25x^2 + 2$
 $\log_7 y - \log_7 25x^2 = 2$
 $\log_7 \frac{y}{25x^2} = 2$
 $\frac{y}{25x^2} = 7^2$
 $\boxed{y = 49(25x^2)}$

(c) $2(\log_9 y + 2 \log_9 x) = 1$

$\log_9 y + \log_9 x^2 = \frac{1}{2}$

$\log_9 (y^2 x^2) = \frac{1}{2}$

$y^2 x^2 = 9^{\frac{1}{2}}$

$y^2 = \frac{3}{x^2}$

$y = \pm \sqrt{3}/x$

(d) $2^y = e^x$

$\ln 2^y = \ln e^x$

$y \ln 2 = x \ln e$

$y = x / \ln 2$

(e) $10^y = 3^{x+1}$

$\ln 10^y = \ln 3^{x+1}$

$y \ln 10 = (x+1) \ln 3$

$y \ln 10 = x \ln 3 + \ln 3$

$y = \frac{x \ln 3 + \ln 3}{\ln 10}$

(Q4) $3^{456} = x_1$

$4^{329} = x_2$

$\log 3^{456} = \log x_1$

$\log 4^{329} = \log x_2$

$456 \log 3 = \log x_1$

$329 \log 4 = \log x_2$

$217.56729 = \log x_1$

$\log x_2 = 198.0777$

$x_1 = 10^{217} \cdot 10^{0.56729}$

$x_2 = 10^{198} \cdot 10^{0.777}$

$x_1 = 3.69 \times 10^{217}$

$= 5.98 \times 10^{198}$

x_1 is larger

(Q5) (a) $\log_3 45$

$= \frac{\log 45}{\log 3} = 3.465$

(b) $\log_4 7$

$= \frac{\log 7}{\log 4}$

$= 1.404$

(c) $\log_3 (\frac{\log 12}{\log 2})$

$= \frac{\log (\log 12 / \log 2)}{\log 3}$

$= 1.162$

(Q6) (a) $\log_4 12 - \log_4 3$

$= \log_4 (\frac{12}{3}) = \log_4 (4) = 1$

(b) $\frac{1}{3} \log_5 64 \times \log_2 5$

$= \log_5 64^{\frac{1}{3}} \times \log_2 5$

$= \log_5 4 \times \log_2 5$

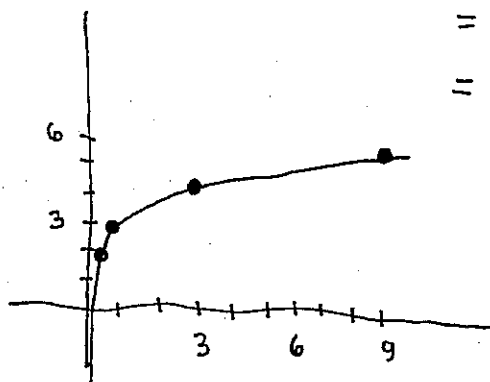
$= \frac{\log_2 4}{\log_2 5} \times \log_2 5 = \log_2 4 = 2$

(Q7) $y = -\log_{\frac{1}{3}} x + 3$

$y - 3 = -\log_{\frac{1}{3}} x$

$\log_{\frac{1}{3}} x = 3 - y$

$(\frac{1}{3})^{3-y} = x$



domain: $(0, \infty)$

range: $(-\infty, \infty)$

y	3	2	1	4	5	6
x	1	1/3	1/9	3	9	27

ASSIGNMENT 5

Applied Math (201-943-DW S1)

DUE Date: FRIDAY November 16th 2010, 10:00am

Instructor: E. Richer

Question 1. 4 marks

Determine the value of x .

(a) $\log_9 x = 3$

(b) $\log_{12} 144 = x - 3$

(c) $\log_x 243 = 5$

(d) $\log_x 5 = \frac{1}{2}$

Question 2. 6 marks

Express each as a sum, difference or a multiple of logarithms. Wherever possible, evaluate the result or any part of the result.

(a) $\log_5 \frac{7}{a}$

(b) $\log_3 \sqrt{27}$

(c) $\log_6 \frac{5}{36}$

(d) $\log_6 \sqrt{72}$

(e) $\log(10000x^3)$

(f) $\log_3(9^2 \times 6^3)$

Question 3. 10 marks

Solve for y in terms of x .

(a) $\log_3 y = \frac{1}{2} \log_3 7 + \frac{1}{2} \log_3 x$

(b) $\log_7 y = 2 \log_7 5 + 2 \log_7 x + 2$

(c) $2(\log_9 y + 2 \log_9 x) = 1$ ← BRACKET

(d) $2^y = e^x$

(e) $10^y = 3^{x+1}$

Question 4. 4 marks

Determine which of the following values is bigger. Hint: Use logarithms to express the numbers in scientific notation.

3^{456} or 4^{329}

Question 5. *1.5 marks*

Use your calculator to evaluate the following (answer with 3 decimal places).

(a) $\log_3 45$

(b) $\log_4 7$

(c) $\log_3(\log_2 12)$

Question 6. *3 marks*

Show how the following expressions could be evaluated without a calculator.

(a) $\log_4 12 - \log_4 3$ \rightarrow BASE 4

(b) $\frac{1}{3} \log_5 64 \times \log_2 5$

Question 7. *1.5 marks*

Graph the function $y = -\log_{\frac{1}{3}} x + 3$. Give its domain and range.