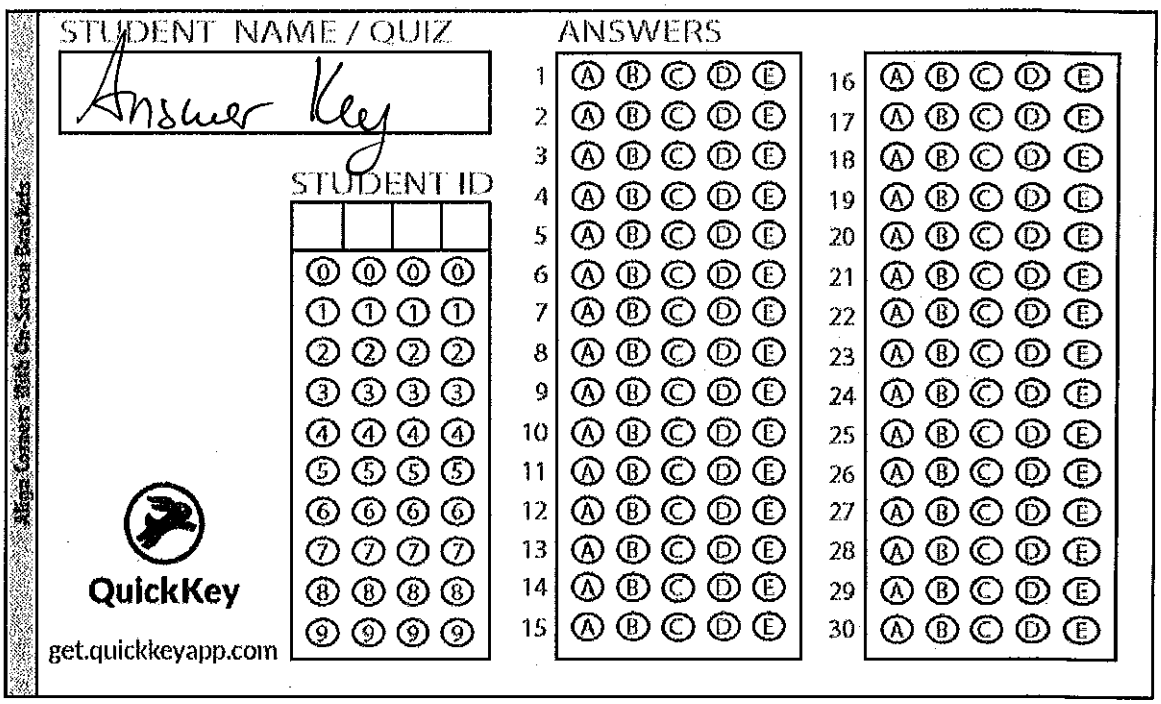
Math 3201 **Name:** _____
Unit 7 – Logarithmic Functions
Assignment 1 – Unit Assignment



Part 1 – Selected Response:

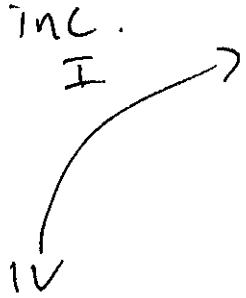
Instructions: **Choose the best answer and shade it in the corresponding space on the answer sheet provided.**

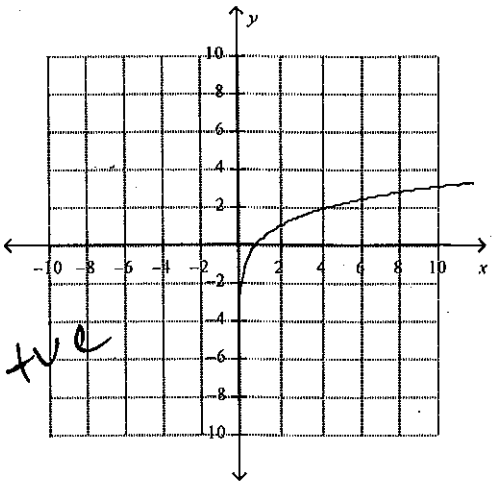
_____ 1. What is the x-intercept of $f(x) = -3 \ln x$?

(A) -1
(B) 0
(C) 1
(D) -3

_____ 2. What is the end behaviour of $f(x) = 5 \log x$?

(A) I to II
(B) I to IV
(C) II to I
(D) IV to I





_____ 3. What is the function that gives the graph provided?

(A) $f(x) = -\frac{1}{3}\ln x$
(B) $f(x) = 3\log x$
(C) $f(x) = -\frac{1}{3}(3)^x$
(D) $f(x) = 0.3(10)^x$

inc
log a +ve

_____ 4. Which of the following describes the function $f(x) = 2\log x$?

inc x int @ 1

(A) Decreasing with a x-intercept of 1
(B) Decreasing with a x-intercept of 2
(C) Increasing with a x-intercept of 1
(D) Increasing with a x intercept of 2

_____ 5. What is the exponential form of $y = \log_4 20$?

$4^y = 20$

(A) $20^y = 4$
(B) $4^y = 20$
(C) $y^{20} = 4$
(D) $y^4 = 20$

_____ 6. What is an estimate the value of y in the exponential equation $50 = e^y$?

$\ln 50 = y$

(A) 0.3
(B) 1.7
(C) 2.9
(D) 3.9

_____ 7. Determine the concentration of hydrogen ions in bleach, with a pH of 12.8. Recall that pH, p(x), is defined by the equation $p(x) = -\log x$ where the concentration of hydrogen ions, x, in a solution is measured in moles per liter.

$con = 10^{-pH}$

(A) $1.3 \times 10^{-13} mol/L$
(B) $1.6 \times 10^{-13} mol/L$
(C) $1.3 \times 10^{-12} mol/L$
(D) $1.6 \times 10^{-12} mol/L$

_____ 8. What is $\log_3 100 - 2\log_3 5$ written as a single logarithm?

$\log_3(100) - \log_3(5^2)$
div
$\log_3\left(\frac{100}{25}\right)$

(A) $\log_3 4$
(B) $\log_3 10$
(C) $\log_3 1000$
(D) $\log_3 2500$

_____ 9. Evaluate: $\log_2(\frac{1}{128})$

(A) -64
(B) -7
(C) 7
(D) 64

$\frac{\log\left(\frac{1}{128}\right)}{\log 2} =$

_____ 10. What is the logarithmic form of $C = 2^m$?

(A) $m = \log_2 C$
(B) $m = \log_m 2$
(C) $C = \log_2 m$
(D) $C = \log_m 2$

$\log_2(C) = m$

_____ 11. Evaluate: $3\log_2 8 - 3\log_2 4$

(A) 2
(B) 3
(C) 4
(D) 18

$3\left(\frac{\log 8}{\log 2}\right) - 3\left(\frac{\log 4}{\log 2}\right)$

$3(3) - 3(2)$

$9 - 6 =$

_____ 12. Which value is the best estimate for $y = \log_4 500$?

(A) 0.2
(B) 0.6
(C) 2.7
(D) 4.5

$\frac{\log 500}{\log 4}$

_____ 13. Solve: $4^{x+1} = 7$

(A) $\frac{\log 4}{\log 7} - 1$
(B) $\frac{\log 7}{\log 4} - 1$
(C) $\frac{\log 4 - 1}{\log 7}$
(D) $\frac{\log 7 - 1}{\log 4}$

$\log_4(7) = x + 1$

$\frac{\log 7}{\log 4} = x + 1$

$\frac{\log 7}{\log 4} - 1 = x$

_____ 14. The number of ants in a colony is modelled by the equation $N(d) = 120(1.14)^w$ where $N(d)$ represents the number of ~~bees~~ ants and w represents the number of weeks from now. After how many ~~days~~ weeks will there be 200 ants?

(A) 4
(B) 5
(C) 6
(D) 7

$\frac{200}{120} = \frac{120}{120}(1.14)^w$

$1.67 = (1.14)^w$

$\frac{\log 1.67}{\log 1.14} = w \frac{\log(1.14)}{\log}$

_____ 15. Which expression is equivalent to $\log\left(\frac{\sqrt{A}B}{C^3}\right)$?

(A) $\frac{1}{2}\log A - \log B + 3\log C$
(B) $\frac{1}{2}\log A + \log B - 3\log C$
(C) $2\log A - \log B + \frac{1}{2}\log C$
(D) $2\log A + \log B - \frac{1}{3}\log C$

$\log \frac{A^{\frac{1}{2}} B}{C^3}$

$\frac{1}{2}(\log A + \log B - 3\log C$

Part 2 – Constructed Response:

Instructions: Complete all of the following in the space provided. For full marks be sure to show all workings and present your answers in a clear and concise manner.

1. Simplify then evaluate:

(A) $4\log_4 2 - \log_4 8$ (1)

$= \log_4(2^4) - \log_4(8)$

$= \log_4(16) - \log_4(8)$

$= \log_4\left(\frac{16}{8}\right)$

$= \log_4(2)$

$= \frac{\log 2}{\log 4} = \frac{1}{2}$

(B) $\frac{1}{2}\log 64 + 3\log 5$ (1)

$= \log(64^{\frac{1}{2}}) + \log(5^3)$

$= \log(8) + \log(125)$

$= \log(8 \cdot 125)$

$= \log(1000)$

$= 3$

2. Algebraically solve: $6^{x-2} = 5^{x+3}$ (2)

$(x-2)\log 6 = (x+3)\log 5$

$x\log 6 - 2\log 6 = x\log 5 + 3\log 5$

$x\log 6 - x\log 5 = 3\log 5 + 2\log 6$

$\frac{0.079x}{0.079} = \frac{3.653}{0.079}$ $\quad x = 46.24$

3. After taking a cough suppressant, the amount, A, in mg, remaining in the body is given by:

$A = 400\left(\frac{1}{2}\right)^t$, where t is given in hours.

(A) What is the initial amount taken? (1)

400 mg

(B) What percent of the drug leaves the body each hour? (1)

50%

(C) Algebraically determine how much of the drug is left in the body 6 hours after the dose is given? (1)

$A = 400\left(\frac{1}{2}\right)^6 = 6.25$ mg

(D) How long is it until only 1 mg of the drug remains in the body? (2)

$\frac{1}{400} = 400\left(\frac{1}{2}\right)^t$ $\quad t = 8.6$ h.

$\frac{\log\left(\frac{1}{400}\right)}{\log\left(\frac{1}{2}\right)} = t \log\left(\frac{1}{2}\right)$

4. The pH scale is used to measure the acidity of a solution. The pH, $p(x)$, is defined by the equation $p(x) = -\log x$, where the concentration of hydrogen ions, x, in a solution is measured in moles per litre (mol/L).

(A) Black coffee has a pH of 5. What is its hydrogen ion concentration? (1)

$x = 10^{-p(x)}$

$= 10^{-5}$ mol/L

(B) Water has a pH of 7. In terms of concentration, how much more acidic is black coffee than water? (2)

$x = 10^{-pH}$

$= 10^{-7}$ mol/L

con. coffee 10^{-5} mol/L

con. water 10^{-7} mol/L

$\frac{10^{-5}}{10^{-7}} = 10^{2} = 100$

coffee is 100 times more acidic.

5. Identify any error(s) in the solution below and provide the correct solution. (3)

$\frac{1}{2}\log_2 36 + \left(2\log_2 6 - \frac{1}{2}\log_2 81\right)$

$= \log_2 36^{\frac{1}{2}} + \left(\log_2 6^{2} - \log_2 81^{\frac{1}{2}}\right)$ ②

$= \log_2 18 + (\log_2 12 - \log_2 9)$ ③

$= \log_2 18 + (\log_2 3)$ ④

$= \log_2 21$

① $\log_2(36^{\frac{1}{2}})$ is $\log_2\sqrt{36}$ not $36/2$, should be $\log 6$

② $\log_2 6^2$ is $\log_2(6\cdot 6) = \log 36$ not $\log(6\cdot 2)$.

③ when sub. logs you divide arguments. $\log_2(12) - \log_2 9 = \log\left(\frac{12}{9}\right)$

④ when adding logs you multiply arguments, $\log 18 + \log 3$ should be $\log(18\cdot 3)$

5) cont $\frac{1}{2}\log_2(36) + (2\log_2 6 - \frac{1}{2}\log_2 81)$

$= \log_2(36^{\frac{1}{2}}) + [\log_2(6^2) - \log_2(81^{\frac{1}{2}})]$

$= \log_2 6 + [\log_2 36 - \log_2 9]$

$= \log_2 6 + \log_2(\frac{36}{9})$

$= \log_2 6 + \log_2 4$

$= \log_2(6 \cdot 4)$

$= \log_2(24)$