(#1, 2, 3, 4, 5, 6, 9, 10) ONLY

Knowledge/Understanding

1) (2 marks) Convert:

a. $3^4 = 81$ to logarithmic form.

b. $\log_3 \sqrt{3} = \frac{1}{2}$ to exponential form.

2) (8 marks) Use the laws of logarithms to evaluate. Leave all answers in exact form.

a. $\log_4\left(\frac{1}{256}\right)$ (1 mark)

b. $\log_3 18 + \log_3 5 - \log_3 10$ (2 marks)

c. $3\log_2\left(\frac{1}{2}\right) - 2\log_2\left(\frac{1}{4}\right)$ (3 marks)

d. $\log_4 48 + \log_4\left(\frac{4}{3}\right)$ (2 marks)

3) (7 marks) Fill in the table below for the logarithmic function.

Characteristic	$f(x) = \frac{1}{2}\log_2\left[2(x-1)\right] - 1$
Type of Function	
The Domain	
The Range	
Intercept(s)	

Intervals of increase	
Interval of decrease	
Equation(s) of any asymptote(s)	

4) (9 marks) Solve.

a. $\frac{1}{3}\log x = 1$ (2 marks)

b. $\log_2(x+3) + \log_2(x-3) = 4$ (4 marks)

c. $3(4)^{3x-2} = 192$ (3 marks)

Application

5) (4 marks) Due to employee safety negligence at a nuclear waste facility, 2000 tons of a radioactive element is spilled into the nearby pond. The half-life of the radioactive element is 36 days. In order to be declared safe for swimming, based on its size and the amount of water, there must be less than 100 tons of the material found in the pond. How long, to the nearest day, until it is safe to swim again?

6) (5 marks) How many more times intense, to two decimal places, was the 2011 earthquake in Japan that measured 9.0 on the Richter scale than the 1905 earthquake in San Francisco that measured 8.1 on the Richter scale?

7) (1 mark) Determine the pH of a solution with a hydrogen ion concentration of 0.00101mol/L.

Inquiry

8) (1 mark) Is it possible to determine a real solution for the expression below? Explain your reasoning.

$$\frac{1}{3}\log_2(-8)$$

9) (4 marks) Given that $x = \log_3 5$ and $y = \log_3 2$, rewrite $\log_3 60$ in terms of x and y.

10) (4 marks) Given that $\log_2 a + \log_2 b = 3$, calculate all the possible integer values of a if b is also an integer value. Explain your reasoning.