

Name \_\_\_\_\_ Date \_\_\_\_\_ /

Multiple Choice: Read each question carefully and circle the correct answer.

1. If  $\log_2 3 = x$ , then  $\log_2 8\sqrt{3}$  can be represented as an algebraic expression, in terms of  $x$ , as

- A.  $\frac{1}{2}x + 8$
- B.  $\frac{1}{2}x + 3$
- C.  $2x + 8$
- D.  $2x + 3$

2. The logarithm  $\log_3 \frac{x^p}{x^q}$  is equal to

- A.  $(p - q) \log_3 x$
- B.  $\frac{p}{q}$
- C.  $p - q$
- D.  $\frac{p}{q} \log_3 x$

3. Change to logarithmic form:  $2^{-3} = \frac{1}{8}$ 

- A.  $\log_2 \frac{1}{8} = -3$
- B.  $\log_{-3} 8$
- C.  $\log_8 \frac{2}{3}$
- D.  $\log 2 = \log \frac{1}{8}$

4. Change  $\log_2(3x) = 5$  to exponential form

- A.  $3x = 2^5$
- B.  $3x = 5^2$
- C.  $2 = 3x^5$
- D.  $2 = (3x)^5$

5. When solving:  $\frac{1}{2} - \log_{16}(x - 3) = \log_{16} x$ , **the proposed** solution is

- A. -1 and 4
- B. 4
- C. -4 and 1
- D. -4

➤ For an extra 2marks, identify whether the proposed solution valid and explain why.

6. Evaluate  $\log_5 \sqrt{5^3}$

- A.  $\frac{1}{6}$
- B.  $\frac{2}{3}$
- C.  $\frac{3}{2}$
- D. 6

7. The pH of a solution is defines and  $\text{pH} = -\log[H^+]$  is the hydrogen ion concentration, in moles per litre. Acetic acid has a pH of 2.9. Formic acid is 4 times as concentrated as acetic acid. What is the pH of formic acid?

- A. 1.1
- B. 2.3
- C. 3.5
- D. 6.9

8. The exponential form of  $k = -\log_h 5$  is

- A.  $h^k = \frac{1}{5}$
- B.  $k^h = \frac{1}{5}$
- C.  $h^k = -5$
- D.  $k^h = -5$

9. The effect on the graph of  $\log_3 x$  if it is transformed to  $y = \log_3 \sqrt{x+7}$  can be described as

- A. a vertical stretch about the x-axis by a factor of  $\frac{1}{2}$  and a vertical translation of 7 units up
- B. a vertical stretch about the x-axis by a factor of  $\frac{1}{2}$  and a horizontal translation of 7 units left
- C. a horizontal stretch about the y-axis by a factor of  $\frac{1}{2}$  and a vertical translation of 7 units up
- D. a horizontal stretch about the y-axis by a factor of  $\frac{1}{2}$  and a horizontal translation of 7 units left

10. Evaluate  $\log_3 81$

- A. 0
- B. 3
- C. 4
- D.  $\sqrt[3]{81}$

11. Solve the equation  $-2\log_5 7x = 2$

- A. 35
- B.  $\frac{7}{5}$
- C.  $\frac{5}{7}$
- D.  $\frac{1}{35}$

12. Solve for x:  $2\log x = \log 32 + \log 2$

- A. 64
- B. 8
- C. 16
- D. 32

13. Determine the base of the following logarithm:  $\log_2 5$

- A. 2
- B. 32
- C. 5
- D. 25

14. Find the inverse of  $y = 2^{x-3} + 1$

- A.  $y = \frac{1}{2^{x-3}+1}$
- B.  $y = \log_2(x - 1) + 3$
- C.  $y = \log_2(x + 1) - 3$
- D.  $y = \log_2(x - 3) + 1$

15. Solve for x if  $16^{x-7} + 5 = 24$

- A. 10.21
- B. 8.06
- C. -5.82
- D. no real solutions

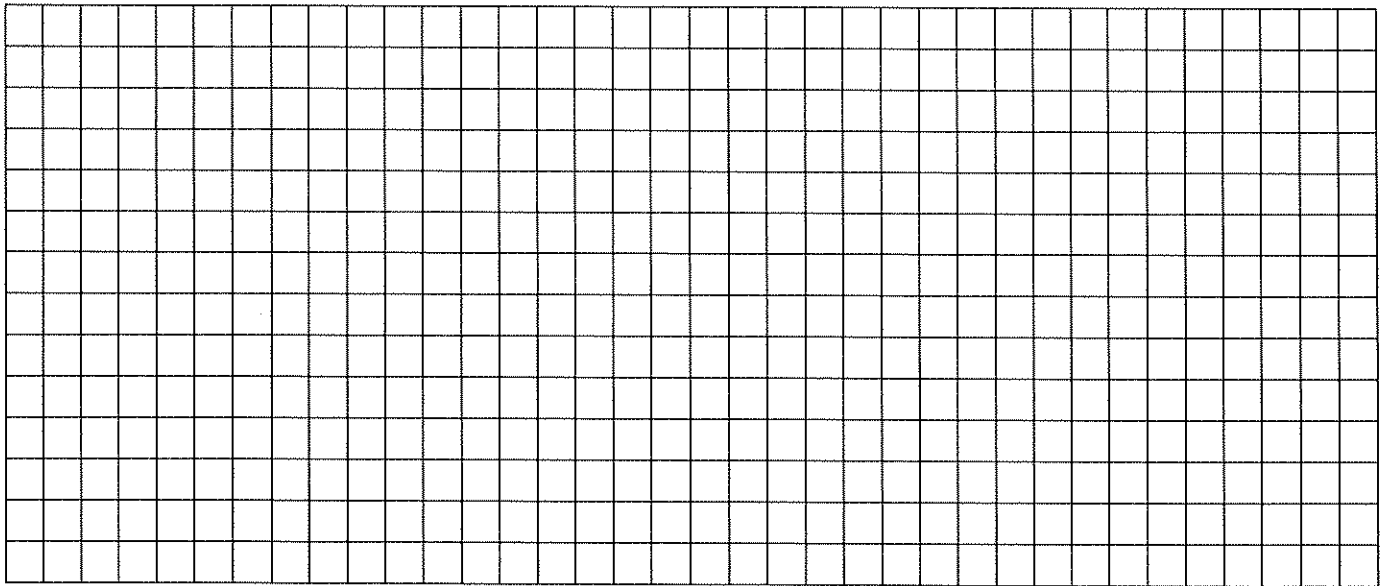
**Short Answer**

Please SHOW ALL WORK for full marks.

1. a) Rewrite the function  $y = 2^{-2x+4} + 6$  in the form  $f(x) = a(2)^{b(x-h)} + k$ : \_\_\_\_\_

b) Describe the transformations that must be applied to the graph of  $y = 2^x$  to obtain the graph of the given function. **Three points have to be exact.** You may find mapping notation useful.

c) Graph the function on the grid below



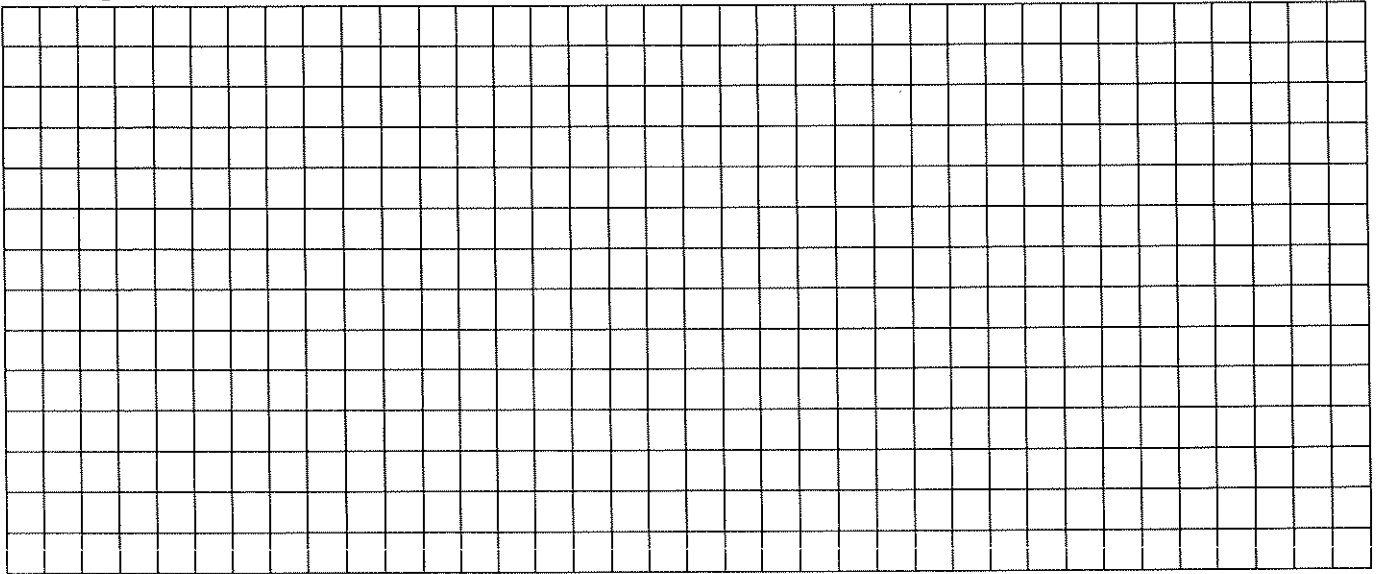
d) Determine the equation of the function  $g(x)$  that results after the graph in part c) is reflected in the x-axis.

\_\_\_\_\_

e) Graph the function from d) on the same grid and label the graph  $g(x)$

2. a) Sketch a graph of a function  $f(x) = -\log_3(2x - 6) - 1$

**Three points have to be exact.** You may find mapping notation useful.



Identify the domain \_\_\_\_\_ range \_\_\_\_\_ of  $f(x)$

and the equation of any asymptotes if they exist \_\_\_\_\_

3. Write as a single logarithm:  $4 \log a^2 - 2 \log a$

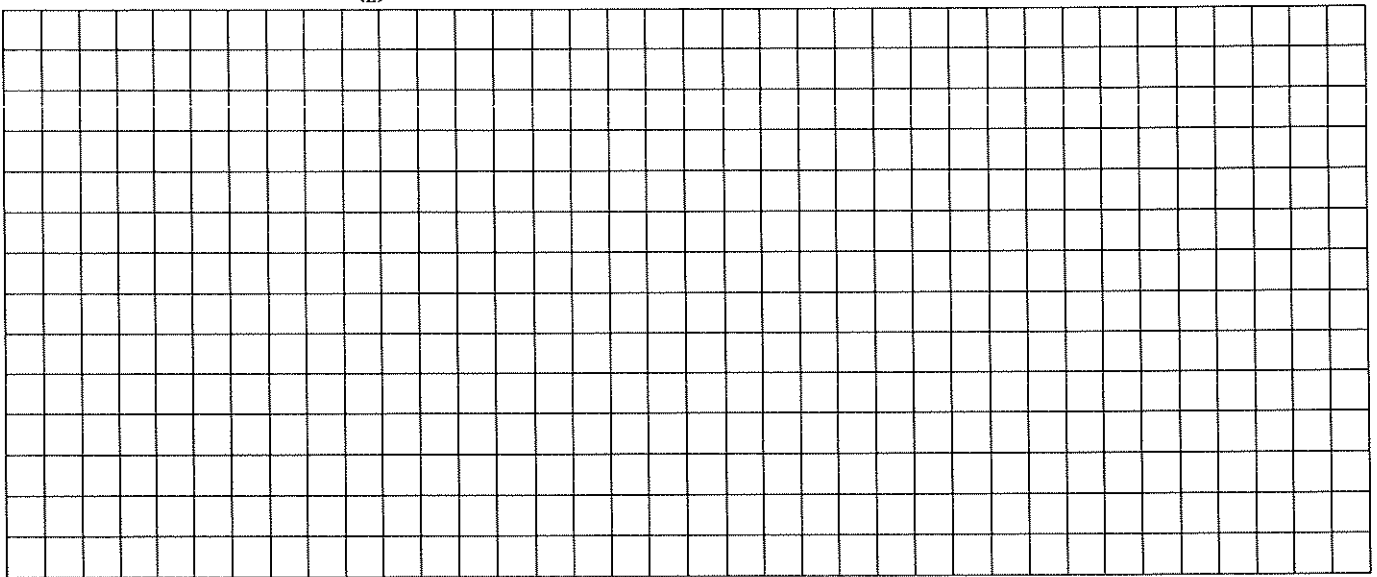
4. Solve:  $-10 + \log_3(x + 3) = -10$

5. The sound intensity level  $\beta$ , in decibels is defined as  $\beta = 10 \log \frac{I}{I_0}$ , where  $I$  is the intensity of the sound, in watts per square meter, and  $I_0$ , the threshold of hearing, is  $10^{-12} W/m^2$ . A refrigerator in the kitchen of a restaurant has a decibel level of 45dB. How many times as intense is the sound of the refrigerator as the sound of a chainsaw at 85dB?

**BONUS: Only completely correct solutions will earn the bonus marks. You may use an additional sheet of paper.**

1. Solve  $\log_2(\log_x(x + 6)) = 1$  Remember to clearly identify restrictions and valid solutions

2. a) Graph  $y = 2^x$  and  $y = \left(\frac{1}{2}\right)^x$



b) Describe the relationship between the two functions **in two different ways**

3. If  $y = \log x$ , then calculate  $y + 2$  and express it as a single logarithm





