



MHF 4U

TEST SUMMARY - TEST #3 NAME: \_\_\_\_\_

Knowledge and Understanding	Inquiry	Communication	Application
/20	/20	/20	/15

\*Note: 5 marks will be awarded for communication.

Communication throughout the test will be evaluated on 1) significant digits (avoid rounding off errors) 2) correct mathematical form 3) well-labelled diagrams 4) organized, neat and legible 5) Show all work with concluding statements.

Level 4	Level 3	Level 2	Level 1
communicates for different audiences and purposes with a high degree of effectiveness and uses conventions, vocabulary, and terminology of the discipline with a high degree of effectiveness	communicates for different audiences and purposes with considerable effectiveness and uses conventions, vocabulary, and terminology of the discipline with considerable effectiveness	communicates for different audiences and purposes with some effectiveness and uses conventions, vocabulary, and terminology of the discipline with some effectiveness	communicates for different audiences and purposes with limited effectiveness and uses conventions, vocabulary, and terminology of the discipline with limited effectiveness

## **Part A: Knowledge and Understanding (20 marks)**

Multiple Choice: Please circle the most correct answer. Each question is worth one (1) mark each for a total of ten (10) marks.

- The function  $f(x) = \left(\frac{1}{8}\right)^x$  passes through the point.  
a)  $(-1, 8)$                       b)  $(1, -8)$                       c)  $(-1, -8)$                       d)  $(1, 8)$
- The function  $f(x) = \left(\frac{1}{6}\right)^x$  has a y-intercept of  
a) 6                                  b) -6                                  c) 1                                  d) -1
- The function  $y = 3^x$  passes through the point.  
a)  $(3, 1)$                       b)  $(-1, 3)$                       c)  $(1, 3)$                       d)  $(3, -1)$
- The x-intercept of the function  $y = 2^x$  is  
a) 1                                  b) 2                                  c) 0                                  d) does not exist

5. The exponential function for the following data set is

x	y
- 3	64
- 2	16
- 1	4
0	1

a)  $y = 4^x$

b)  $y = 2^x$

c)  $y = (\frac{1}{4})^x$

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

6. Another way of writing  $81 = 3^4$  is

a)  $\log_4 3 = 81$

b)  $\log_3 4 = 81$

c)  $\log_3 81 = 4$

d)  $\log_{81} 3 = 4$

7. Another way of writing  $3 = \log_6 216$  is

a)  $3^6 = 216$

b)  $216 = 6^3$

c)  $216^{-6} = 3$

d)  $6^{216} = 4$

8. Evaluate  $\log_4 16^2$

a) 16

b) 4

c) 2

d) 12

9. Evaluate  $\log_3 (\frac{1}{9})^2$

a) - 4

b) - 2

c)  $-\frac{1}{2}$

d) 9

10. The equation of the vertical asymptote for the function  $y = 2\log(x - 4)$  is

a)  $x = 4$

b)  $x = - 4$

c)  $x = 2$

d)  $x = 0$

**True or False - indicate whether the statement is true or false by writing the word “true” or “false” in the space provided.**

11. If  $y = 3^x$ , then  $x = \log_3 y$  \_\_\_\_\_

12. You can write  $\log 25^4$  as  $4\log 25$  \_\_\_\_\_

13. The y-intercept for all exponential functions is 1. \_\_\_\_\_

14. The y-intercept of the exponential function  $6^x$  is 1. \_\_\_\_\_

15. The graph of  $f(x) = \log(x - 4)$  has a vertical asymptote at  $x = 4$  \_\_\_\_\_

16. If  $f^{-1}(x) = 5^x$ , then  $f(x) = \log 5x$ . \_\_\_\_\_

17. The transformation applied to  $f(x) = \log(x + 3) - 4$  is translated 3 left and 4 up. \_\_\_\_\_

18. Logarithmic functions are defined only for positive values of the base that are not equal to 1. \_\_\_\_\_

19. All exponential functions have a vertical asymptote. \_\_\_\_\_

20. You can write  $\log_3 18$  as  $\frac{\log 3}{\log 18}$ . \_\_\_\_\_

**Part B: Inquiry (20 marks)**

1. Solve and check for extraneous roots. (4 marks each)

a)  $\log_2 x + \log_2(x - 4) = 5$

b)  $\log_5(2x + 1) = 1 - \log_5(x + 2)$

2. Evaluate each using the power laws of logarithms without the aid of a calculator

(2 marks each)

a)  $\log 10\,000^{-3}$

b)  $\log 0.01^{-2}$

3. Solve for x, correct to 3 decimal places

(2 marks each)

a)  $x = \log_4 23$

b)  $\log_3 0.45 = x$

4. Solve for x, correct to 3 decimal places. Check for extraneous roots. (4 marks)

$$4^{2x} = 2(4)^x + 1$$

**Part C: Communication (15 marks)**

1. Complete each statement with the most appropriate word from the box below (1 mark each)

decreasing	increasing	inverse	positive values	change of base
horizontally	vertically	reciprocal	negative values	quotient

- a) The logarithmic function is the \_\_\_\_\_ of the exponential function.
- b) The function  $y = b^x$ ,  $0 < b < 1$ , is \_\_\_\_\_ on its domain.
- c)  $\log_4 17 = \frac{\log 17}{\log 4}$  is an example of the \_\_\_\_\_ formula.
- d) Exponential and logarithmic functions are defined only for \_\_\_\_\_ of the base that are not equal to 1.
- e) The function  $y = 2\log 2x$  is compressed \_\_\_\_\_ by a factor of  $\frac{1}{2}$ .
2. Explain the differences between a logarithmic and exponential functions (4 marks)

3. Match each equation to the appropriate graph by writing the letter of the equation on top of the most appropriate graph (6 marks).

A:  $y = -2 \log(2x) + 2$

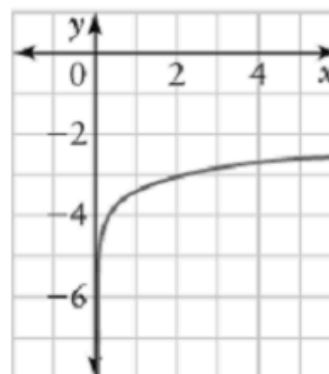
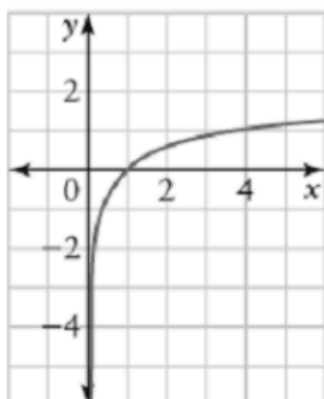
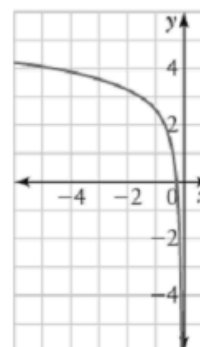
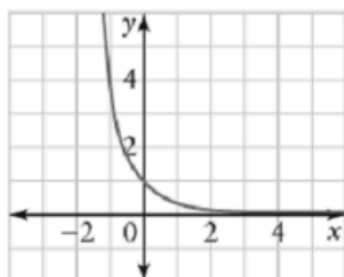
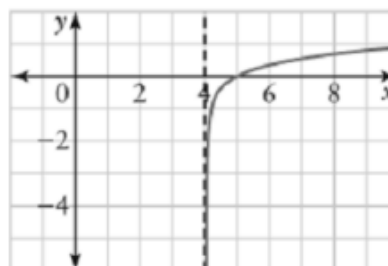
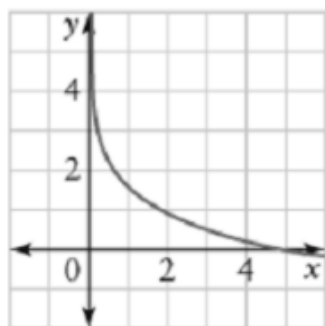
B:  $y = 2 \log(-2x) + 2$

C:  $y = \log(x - 4)$

D:  $y = \left(\frac{1}{4}\right)^x$

E:  $y = \log_4 x$

F:  $y = \log(4x) - 4$



**Part D: Application (15 marks)**

1. To compare intensities of earthquakes use the formula  $\log_{10} \frac{I_1}{I_2} = R_1 - R_2$  where  $I_1$  is the intensity of the quake being measured,  $I_2$  is the intensity of the reference quake and  $R_1 - R_2$ . How many times more intense is an earthquake measuring 5.2 on the Richter scale than an earthquake measuring 4.3 on the Richter scale? (5 marks)
2. Adrian buys a used car for \$5900. The car depreciates at a rate of 15% per year. How long will it take for the car to be worth half of its original value? (5 marks)
3. The formula used to measure sound is  $L = 10\log(\frac{I}{I_0})$ , where  $L$  is the loudness measured in decibels,  $I$  is the intensity of the sound being measured and  $I_0$  is the intensity of sound at the threshold of hearing. Use the chart below to help you determine how many times more intense the sound of a rock concert is compared to the sound of a subway. (5 marks)

Sound	Loudness (dB)
soft whisper	30
normal conversation	60
shouting	80
subway	90
screaming	100
rock concert	120
jet engine	140
space-shuttle launch	180