

Math 30-2 Unit 7 Assignment**Name:****Logarithmic Functions****Total Marks:** ____/33

Multiple Choice*Identify the choice that best completes the statement or answers the question.*

1. Which exponential equation correctly represents the logarithmic equation $y = \log 50$?

A. $50^y = 10$

B. $10^y = 50$

C. $y^{50} = 10$

D. $y^{10} = 50$

2. Which logarithmic equation correctly represents the exponential equation $e^x = 7$?

A. $x = \ln 7$

B. $x = \ln 10$

C. $7 = \ln x$

D. $10 = \ln x$

3. Evaluate the logarithmic expression

$$\log_{\frac{1}{4}} \left(\frac{1}{256} \right)$$

A. 2

B. 3

C. 4

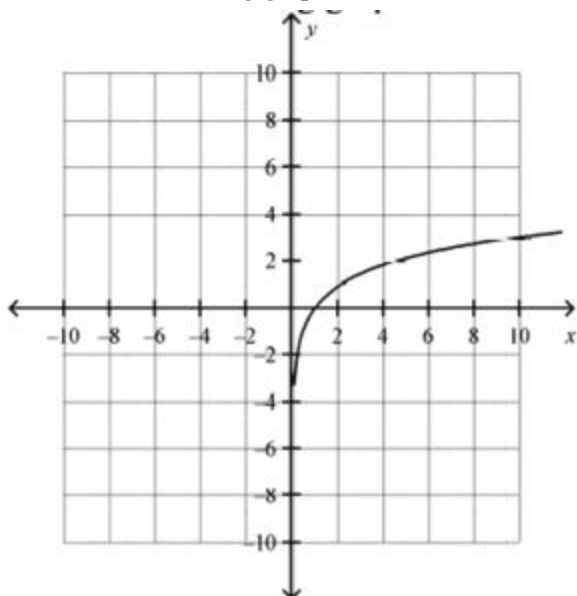
D. 5

$$\log_3 18 + \log_3 \left(\frac{3}{2} \right)$$

4. Evaluate:

- A. 1
- B. 2
- C. 3
- D. 4

5. Match the following graph with its function.



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

6. A laboratory received a shipment of 1000 g of a radioactive compound. Only 31.25 g of the compound

$$A = A_0 \left(\frac{1}{2} \right)^{\frac{t}{h}}$$

remained after 10 days. The half - life equation is , where A represents the amount of the substance remaining, A_0 represents the initial amount of the substance, t represents the time, and h represents the time at which only half of the substance remains.

The half - life of the compound is

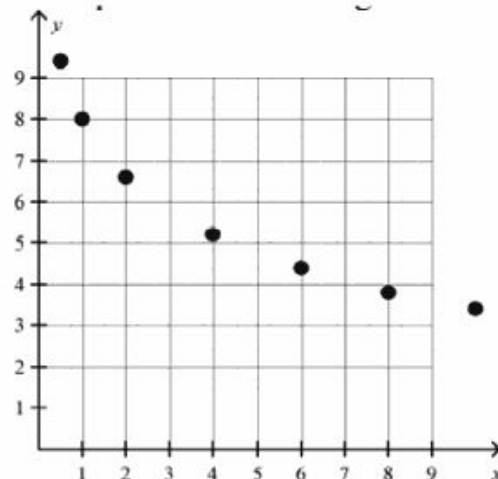
- A. 1/2 day
- B. 1 day
- C. 2 days
- D. 4 days

7. Evaluate: $3 \log_8 24 - 3 \log_8 3$

- A. 3
- B. 7
- C. 1
- D. 64

8. A scatter plot is drawn using the data set shown below. Identify the regression equation.

x	0.5	1	2	4	6	8	10
y	9.3	8	6.8	5.1	4.3	3.9	3.5



- A. $y = 9.5 - \ln x$
- B. $y = 9.5 - 2 \ln x$
- C. $y = 8.0 - \ln x$
- D. $y = 8.0 - 2 \ln x$

9. In 1935 the California seismologist Charles Richter devised a logarithmic scale that bears his name and is still widely used in the United States. The magnitude M on the Richter scale is given as follows:

$M = \frac{2}{3} \log \left(\frac{E}{E_0} \right)$, where E is the energy released by the earthquake, measured in joules, and E_0 is the energy released by a very small reference earthquake, which has been standardized to be

$$E_0 = 10^{4.40} \text{ joules}$$

The 1906 San Francisco earthquake released approximately 5.96×10^{16} joules of energy. What was its magnitude on the Richter scale? Compute the answer to two decimal places.

- A. -0.15
- B. -2.41
- C. 8.25
- D. 12.38

Written Response

Please show/explain your work for full marks.

1. Write $0.2 = \ln x$ as an exponential equation. **(1 mark)**

2. Write $56 = 10^y$ as a logarithmic equation. **(1 mark)**

3. Which expression has the greater value? **(1 mark)**

A. $\log 25 - \log 20$

B. $\log_6 25 - \log_6 20$

4. Calculate, to the nearest tenth, the pH of a solution with a hydrogen ion concentration of 1.5×10^{-10} mol/L. Recall that pH, p , 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. **(1 mark)**

5. Solve the equation $7^x = 100$ to two decimal places. **(1 mark)**

6. David inherits \$10 000 and invests in a guaranteed investment certificate (GIC) that earns, 6%, compounded semi-annually. A function that models the growth of the investment is

$y = 10000 \left(1 + \frac{0.06}{2} \right)^x$, when x = number of semi-annual compounding periods and y = value of investment, in dollars.

a. Explain how you would use technology to determine how many compounding periods it will take for the investment to be worth \$11 000 at 6%, compounded semi – annually. **(2 marks)**

b. Modify the exponential function to reflect an interest rate of 6% compounded monthly, when x = number of monthly compounding periods and y = value of investment, in dollars. **(1 mark)**

7. Rado thinks he has a proof that $\log 25 = 1$. Identify Rado's error and finish his solution.

(2 marks)

Rado's Proof

$$\log 25$$

$$= \log 5 + \log 5$$

$$= 2 \log 5$$

$$= \log 10$$

$$= 1$$

I used the product law.

I simplified the expression.

I used the power law.

I simplified the logarithm.

8. Solve $7^{3x} = 10^{x+4}$, and round your answer to one decimal place. Show your work. (2 marks)

9. The population of frogs in a marsh was recorded for several years.

Year	1	2	3	4	6	7	8
Number Frogs	252	272	284	290	304	308	312

a. Determine the regression equation in the form that models the data. Round all values to the nearest hundredth. (1 mark)

b. Estimate the frog population in the 5th year. Show your work. (1 mark)

c. Estimate the frog population in the 12th year. Show your work. (1 mark)

10. A scuba diver used her camera equipment to measure the intensity of light, in lux, as she dove into a lake. She compared her readings with the depth of water at each point.

Light Intensity (lux)	5.0	4.0	3.0	2.0	1.0
Depth of Water (m)	2.3	3.1	4.0	5.4	7.7

a. Determine the regression equation in the form that models the data. Round all values to the nearest hundredth. **(1 mark)**

b. At what depth, to the nearest tenth of a metre, is the light intensity 3.6 lux? Show your work. **(1 mark)**

c. What is the light intensity at the surface? Round your answer to the nearest tenth. Show your work. **(1 mark)**

11. Given the equation $y = -2 \ln x$, determine all of the characteristics below. **(3 marks)**

a. x-intercepts

b. number of y-intercepts

c. the end behavior

d. domain

e. range

12. State three reasons why you know that the following graph represents a logarithmic function of the form $y = a \log x$. (3 marks)

