

Show your work and provide a full explanation to earn full marks.

1. Solve algebraically. Round your answers to the nearest tenth (if necessary). (1 mark each)

a. $3^{x+2} = 27$

$$= 3^{x+2} = 3^3$$

$$= x+2 = 3$$

$$x = 3 - 2$$

$$x = 1$$

c. $4^x = \frac{1}{256}$

$$2^{2x} = 2^{-8}$$

$$2x = -8$$

$$x = -4$$

e. $15 = 2^x$

$$2^x = 15$$

$$x = \log_2(15)$$

$$x = 3.90689$$

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

$$= 2^{x+1} = 2^{2x-4}$$

$$= x+1 = 2x-4$$

$$= x - 2x = -4 - 1$$

$$-x = -5$$

$$x = 5$$

d. $2^{2x} = \frac{1}{64}$

$$= 2^{2x} = 2^{-6}$$

$$2x = -6$$

$$x = -3$$

f. $5^{(x-1)} = 3$

$$= x-1 = \log_5(3)$$

$$x = \log_5(3) + 1$$

$$x = 1.68261$$

2. Describe how to determine the solution to $3^{(x-1)} = 4^{(x-2)}$ graphically. (2 marks)

Use the following information to answer the next question.

A researcher discovered mould growing in a Petri dish in her laboratory. When first discovered, the mould covered 2% of the dish's surface. Every 12 hours, the surface area of the mould doubles in size, as shown in the table below.

Time (h)	Area covered (%)
0	2
12	4
24	
36	

3. a. Complete the table above and then write an exponential function to model the growth of the mould over time. (2 marks)

- b. Use your function from part a) to determine the approximate length of time, to the nearest tenth of an hour, it will take for the Petri dish to be completely covered with mould. *You may do this algebraically or graphically. (If solved graphically, please **neatly** sketch your graph and solution, and indicate your window settings.) (2 marks)

necessary).

Assignment

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Assignment

Use the following information to answer the next question.

The intensity of an earthquake can be calculated using the formula

$$I = I_0(10)^M$$

where I represents the intensity of an earthquake, M is the magnitude of the earthquake on the Richter scale, and I_0 represents the intensity of an earthquake with a magnitude of 0.

4. Algebraically show why an earthquake with a magnitude of 8.2 is 50 times stronger than an earthquake with a magnitude of 6.5. (2 marks)

Use the following information to answer the next question.

Cobalt-60, which has a half-life of 5.3 years, is used in the sterilization of medical equipment. The amount of cobalt-60 left in a sample can be modelled by the function

$$A(t) = A_0 \left(\frac{1}{2} \right)^{\frac{t}{5.3}}$$

where A_0 represents the original amount and t , the time in years.

5. a. What percent of a sample of cobalt-60 will remain after 9.6 years? Round your answer to the nearest tenth. (2 marks)

- b. How long will it take for a sample of cobalt-60 to decay to 10% of its original amount? Round your answer to the nearest tenth. (3 marks)

Use the following information to answer the next question.

Harjinder deposits \$1000.00 into a savings account that pays 3.2%/a, compounded monthly. A function that models the growth of the deposit is:

$$y = 1000 \left(1 + \frac{0.032}{12} \right)^x$$

where y is the value of the investment after x months.

6.

a. What is the value of the investment after 5 years? (2 marks)

b. Algebraically determine how many months it will take for the investment to be worth \$1500.00. Round your answer to the nearest tenth. (3 marks)

c. Modify the exponential function to reflect an interest rate of 4%/a, compounded quarterly. (1 mark)

7. Write $3^2 = 9$ in logarithmic form. (1 mark)

8. Evaluate $\log_5 \left(\frac{1}{125} \right)$. (1 mark)

9. Write each of the following logarithmic equations in exponential form. (1 mark each)

a. $\log 1000 = 3$

b. $\log_6 36 = 2$

c. $\ln x = 2$

d. $\log_a 5 = 4$

10. Use laws of logarithms to determine the value of each of the following. (2 marks each)

a. $\log_8 2 + \log_8 32$

b. $\log 270 - \log 27$

$$\log_2^3(2) + \log_2^3(2^5)$$

$$\log_{10}(10)$$

$$\frac{1}{3} + \frac{5}{3}$$

$$\textcircled{1}$$

$$\textcircled{2}$$

11. Describe how to estimate the value of $\log_3 23$ without using technology. (2 marks)

12. Express $2 \log a - \log b$ as a single logarithm. (2 marks)

13. Express $\log 12$ in a different log form. (1 mark)

Assignment

14. Complete the following table. (4 marks)

Function	x-int	y-int	End behaviour	Domain	Range	Increasing or Decreasing
$y = 3.5(4)^x$			from Quadrant ____ to Quadrant ____			
$y = 9\left(\frac{1}{2}\right)^x$			from Quadrant ____ to Quadrant ____			
$y = 21 \log x$			from Quadrant ____ to Quadrant ____			
$y = -1.2 \ln x$			from Quadrant ____ to Quadrant ____			

*If there is no x- or y-intercept, write N/A for not applicable.

Use the following information to answer the next question.

The pH of a solution can be determined using the formula

$$pH = -\log(C)$$

where C is the concentration of hydrogen ions in the solution.

15.

- a. Find the pH of a solution with a hydrogen ion concentration of 2×10^{-11} mol/L. Round your answer to the nearest tenth. (1 mark)

- b. The pH of a particular solution is 5.4. If the concentration of hydrogen ions in the solution is doubled, the new pH of the solution will be _____. Round your answer to the nearest tenth. (3 marks)

Assignment

Use the following information to answer the next question.

The population of trout in one section of the Bow River is given from 2007 to 2011.

Population	450	459	469	480	488
Year	2007	2008	2009	2010	2011

16.

a. Determine the equation of the logarithmic regression function that models the data in the form $y = a + b \ln x$. (1 mark)

b. During which year will the population reach 520 trout? (2 marks)

c. If the population continues to grow at the current rate, what is the expected population of trout in 2020? (2 marks)