

Math 104

Test 3 – sample questions

You may use you own book, notes, and calculator. Show work where required. All answers must be in the space provided on the problem sheets.

1) With the function $f(x) = \log_a(x)$, why can't x be less than 0?



2) What is the range of the function $y = \log_3(x)$

- A) (0, ∞) B) (-∞, ∞) C) (0, ∞) D) (3, ∞)

3) Write the logarithmic equation $\log_{15}(1) = 0$ in exponential form.

- A) $0^{15} = 1$ B) $15^1 = 0$ C) $1^{15} = 0$ D) $15^0 = 1$

4) Why is finding the value of $\log_a(a^6)$ like answering the question "What is the name of the girl whose name is Jane?"

5) The decay function of a radioactive element is $f(t) = 200 \cdot e^{-ct}$, where t is measured in hours. The half-life of the element is 2.5 hours. Find c . (Express the result in scientific notation, rounded to the nearest hundredth.) Show work!



$c =$ _____

6) The half-life of an element is 2.5 hours. How long does it take a sample of the element to decay to 5% of its original mass? (Express the result in scientific notation, rounded to the nearest hundredth.) Show work!

_____ hours

7) Express the solution of the equation $e^{0.46x} = 19$ with the help of a logarithm.

x = _____

8) Calculate the solution of the equation $e^{0.46x} = 19$.

(Round to six decimal places.)

x = _____

9) Simplify as far as possible:

$$\ln(e^{4x+6})/2 = \underline{\hspace{2cm}}$$

$$\log_3(80\sqrt[3]{3}) - \log_3(80) = \underline{\hspace{2cm}}$$

10) The following table has the inputs, x, and the outputs for three functions, f, g, and h. Test the rate of change of the outputs to determine which function(s) is (are) exactly exponential. Show work!

x	f(x)		g(x)		h(x)	
0	1		0		8	
1	6		1		4	
2	18		4		2	
3	54		9		1	
4	162		16		0.5	
5	486		25		0.25	

11) Find an exponential function f(x) that models the data below (round the coefficients to two decimal places) and use it to predict about how many books will have been read in the sixth grade.

Grade	Number of books read
2	9
3	27
4	67
5	121

a) $f(x) = \underline{\hspace{2cm}}$

b) books read by grade 6 : $\underline{\hspace{2cm}}$

c) bonus question: is the function in a) the one with the least average square error? Yes / No . Explain:



11a) Can you use the answers to problem 11) to determine an exponential function f(x) that models the data below and use it to predict about how many books will have been read in the eighth grade?.

Grade	Number of books read
4	9
5	27
6	67
7	121

Yes / No

Explain:

12) Find a natural logarithmic regression equation for the following data and use it to estimate the production level for the year 1985. (For the regression equation, assume t = 0 is the year 1950.)

Year	Production (in millions)
1960	9.26
1970	51.43
1990	68.91

a) $f(t) = \underline{\hspace{2cm}}$

b) year 1985: $\underline{\hspace{2cm}}$ (millions)