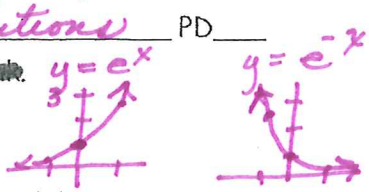
Mrs. Robertson

College Algebra MAC1105 - Practice Test #5 Module 5 (5.1-5.4) Name Solutions PD___

Show work in space provided for each problem. [redacted] the answer in the blank.

Part 1 - NO Calculator

(Graph $y = e^x$ on your own graph paper)



1. Given the graph of $y = e^x$ and the transformations to the exponential function $f(x) = e^{-x} - 3$. Determine the following.

a) Write the domain, in interval notation, of $f(x) = e^{-x} - 3$ $(-\infty, \infty)$

b) Write the range, in interval notation, of $f(x) = e^{-x} - 3$ $(-3, \infty)$

c) Write the y-intercept, as an integer or simplified fraction, of $f(x) = e^{-x} - 3$ $(0, -2)$

y-intercept $\rightarrow x = 0$ $f(0) = e^0 - 3$

$= 1 - 3$

$= -2$

d) Write the horizontal asymptote, an equation, of $f(x) = e^{-x} - 3$ $y = -3$

Solve the exponential equation given, using the method of "relating the bases" by first rewriting the equation in the form $b^u = b^v$. You must show the rewriting for full credit. Simplify your answer as an integer or a fraction. Use a comma to separate answers as needed.

2. $7^x = 49$ $7^x = 7^2$

$x = 2$

x = 2

3. $(8)^x = \left(\frac{1}{2}\right)^{x-1}$, $(2^3)^x = (2^{-1})^{x-1}$

$2^{3x} = 2^{-x+1}$

x = $\frac{1}{4}$

$3x = -x + 1$

$4x = 1$

$x = 1/4$

4. Write the exponential equation, $5^{-3} = \frac{1}{125}$, as an equation involving a logarithm. Use integers or fractions for any numbers in the equation

The logarithmic equation is $\log_5\left(\frac{1}{125}\right) = -3$.

5. Use the definition of a logarithmic function to write the logarithmic equation, $\log_2 K = L$, as an equation involving an exponent. Do not simplify.

The equivalent exponential equation is $2^L = K$.

Evaluate each logarithm, without the use of a calculator. Write as an integer or a simplified fraction.

6. $\log_5 \sqrt[3]{5} = \frac{1}{3}$

$\log_5 5^{1/3}$

7. $\log_2 \frac{1}{8} = -3$

$\log_2\left(\frac{1}{2^3}\right) = \log_2(2^{-3})$

8. $6^{\log_6 5} = 5$

9. $\log_4 4 = 1$

10. $\log_2 1 = 0$

11. Given the equation $f(x) = log_2(x+1)$, determine the following.

a) Two exact points on the graph of $f(x) = \log_2(x+1)$ are

(0 , 0) and (1 , 1).

b) The domain, in interval notation, of f(x) is $(-1, \infty)$.

c) Write the equation of any vertical asymptote(s). If there is none, then write NONE.

Vertical Asymptote(s) $x = -1$

12. Graph the exponential function, $f(x) = -2^{x+1}$. Sketch the asymptote as a dashed line. Use a minimum of three points.

$y = 2^x$

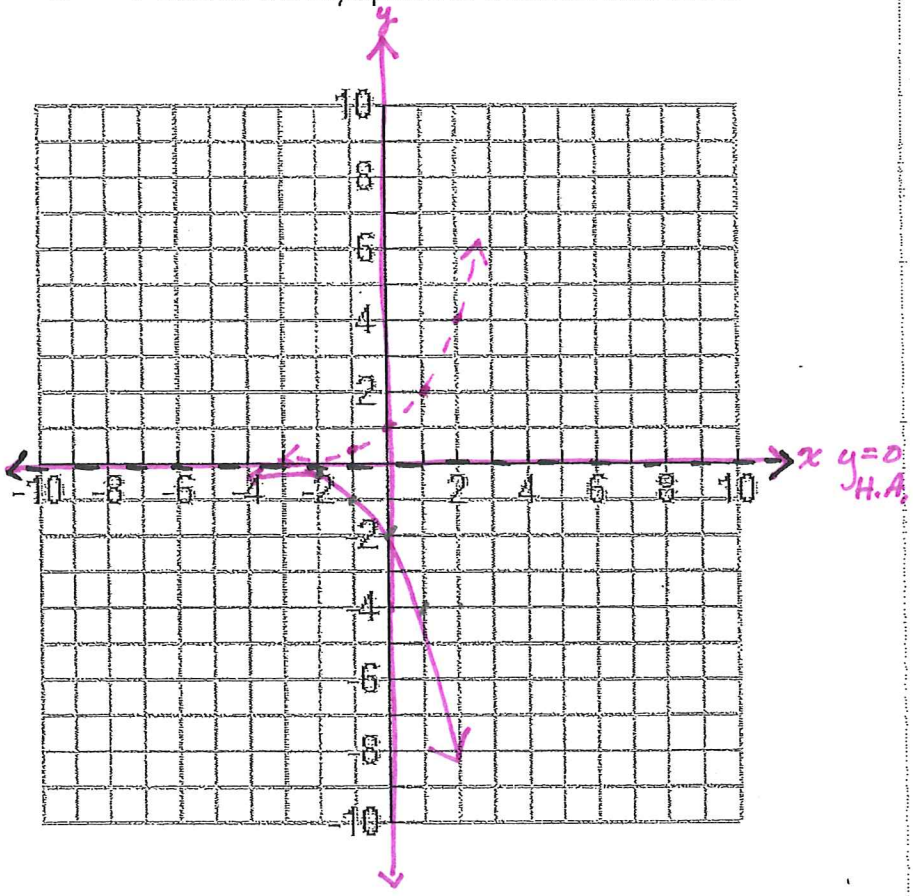
x	y
-1	1/2
0	1
1	2
2	4

$y = -2^x$

x	y
-1	-1/2
0	-1
1	-2
2	-4

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

x	y
-2	-1/2
-1	-1
0	-2
1	-4



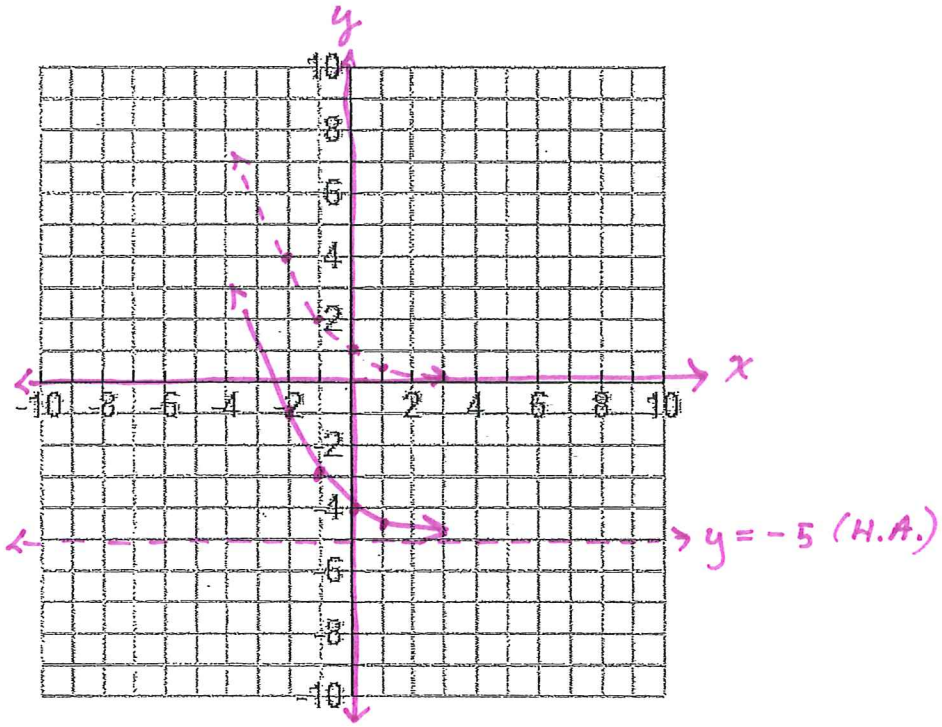
13. Graph the exponential function, $f(x) = \left(\frac{1}{2}\right)^x - 5$. Sketch the asymptote as a dashed line. Use a minimum of three points.

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

x	y
-1	2
0	1
1	½

$y = \left(\frac{1}{2}\right)^x - 5$

x	y
-1	-3
0	-4
1	-4½



14. Graph the logarithmic function, $f(x) = \log_2(x+1) + 3$. Sketch the asymptote as a dashed line. Use a minimum of three points.

-1 to xs +3 to ys

$y = 2^x$

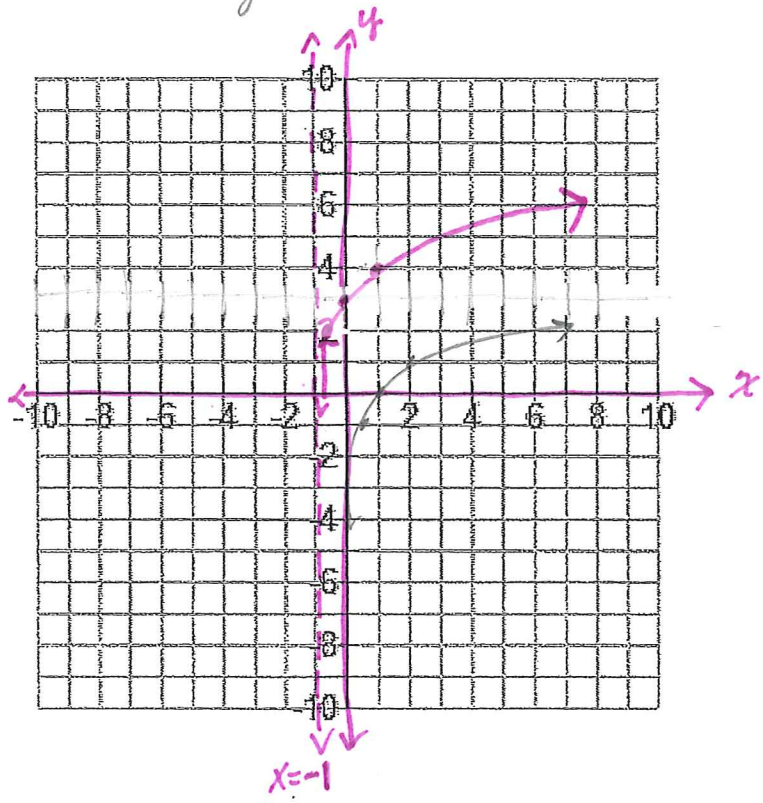
x	y
-1	½
0	1
1	2

$y = \log_2(x)$

x	y
½	-1
1	0
2	1

$y = \log_2(x+1) + 3$

x	y
-½	2
0	3
1	4



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Part 2

15. Typically, weekly sales will drop off rather quickly after the end of an advertising campaign. This drop in sales is known as sales decay. Suppose that the gross sales, S, in hundreds of dollars, of a certain product is given by the exponential function $S(t) = 5000(3^{-0.3t})$ where t is the number of weeks after the end of the campaign. Answer the following questions.

a) What was the level of sales, round to the nearest whole number as needed, immediately after the end of the ad campaign when t = 0?

$S(0) = 5000(3^0)$
$= 5000(1)$
$= 5000$

S(0) = $5,000

b) What is the level of sales, round to the nearest whole number as needed, 1 week after the end of the advertising campaign?

$S(1) = 5000(3^{-0.3(1)})$
$= 5000(3^{-.3})$
$= 3596.115467$

S(1) = $3,596

c) What is the level of sales, round to the nearest whole number as needed, 6 week after the end of the advertising campaign?

$S(6) = 5000(3^{-.3(6)})$
$= 5000(3^{-1.8})$
$= 692.0727442$

S(6) = $692

Use the properties of logarithms to expand the logarithmic expression, Whereever possible, evaluate logarithmic expressions in simplified form.

16. $\ln(9\,e^3)$ = $\ln(9) + 3$

$\ln(9) + \ln(e^3)$

$\ln(9) + 3\ln(e)$

17. $\log_2\left(\frac{P}{8}\right)$ = $\log_2(P) - 3$

$\log_2(P) - \log_2(8)$

$\log_2(P) - \log_2(2^3)$

18. $\ln\left(\frac{a^8\,b^2}{c^7}\right)$ = $\ln(a^8) + \ln(b^2) - \ln(c^7)$

$= 8\ln(a) + 2\ln(b) - 7\ln(c)$ answer

Use the properties of logarithms to rewrite the expression as a single logarithm. Wherever possible, evaluate logarithmic expressions.

19. $4\log_8 x + \frac{1}{3}\log_8 y$ = $\log_8(x^4\sqrt[3]{y})$

$\log_8 x^4 + \log_8 y^{\frac{1}{3}}$

$\log_8(x^4 \cdot \sqrt[3]{y})$

Use the properties of logarithms to rewrite the expression as a single logarithm. Wherever possible, evaluate logarithmic expressions.

20. $\log 50 + \log 200 =$ 4

$\log(50 \cdot 200)$

$\log(10{,}000)$

$\log(10^4) = 4$

21. $\log_4 112 - \log_4 7 =$ 2

$\log_4\left(\frac{112}{7}\right)$ → $\log_4(4^2)$

$\log_4(16)$ → 2

Use the properties of logarithms and the logarithmic property of equality to solve the logarithmic equation. Write as an integer or a simplified fraction. Use a comma to separate answers as needed.

22. $\log_9(3x+2) = \log_9 26$ x = 8

$3x + 2 = 26$

$3x = 24$

$x = 8$

23. $\log_8(x+5) + \log_8(x-3) = \log_8(5x-5)$ x = 5

$\log_8[(x+5)(x-3)] = \log_8(5x-5)$

$x^2 + 2x - 15 = 5x - 5$

$x^2 - 3x - 10 = 0$

$(x-5)(x+2) = 0$

$x = 5, \cancel{x = -2}$

Solve the exponential equation. Round to four decimal places as needed. Use a comma to separate answers as needed. If there is no solution, write NO Solution.

24. $9^x = 7$

x = .8856

$\ln(9^x) = \ln(7)$

$x \ln(9) = \ln(7)$

$x = \frac{\ln(7)}{\ln(9)}$

$X = .8856218746\ldots$

25. $7^{x^2+x} = 49$

x = −2, 1

$7^{x^2+x} = 7^2$

$x^2 + x = 2$

$x^2 + x - 2 = 0$

$(x+2)(x-1) = 0$

$x = -2 \quad x = 1$

26. $e^x = 9$

x = 2.1972

$\ln(e^x) = \ln(9)$

$x = \ln(9)$

$X = 2.197224577\ldots$

Solve the logarithmic equations. Use a comma to separate answers as needed. If there is no solution, write NO Solution.

27. $\log_4(2x-5)=4$ x = 130.5

$2x-5=4^4$

$2x-5=256$

$2x=261$

$x=130.5$

28. $log(6-5x)=2$ x = −18.8

$6-5x=10^2$

$6-5x=100$

$-5x=94$

$x=-18.8$

29. $log_2(x+3)+log_2(x-3)=4$ x = 5

$\log_2[(x+3)(x-3)]=4$

$x^2-9=2^4$

$x^2-9=16$

$x^2=25$

$x=\pm 5$

(−5 will not work)