

DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO

- ❖ Write your name below on the space provided.
- ❖ This test has a total of 5 pages.
- ❖ Work the problem in the space provided. If you need more space, write on the back of the test.
- ❖ To insure maximum credit, show your work. In general, full credit will not be given for unsupported answers.
- ❖ Draw a pumpkin on this page for some credit.
- ❖ Look only at your test. Don't give the impression that you are cheating.
- ❖ Be sure to write neatly. If I cannot read what was written, do not expect the problem to be graded.
- ❖ If you finish early, go over the test again.

Good luck!

Number	Maximum	Score
1	6	
2	5	
3	EC 2	
4	3	
5	4	
6	4	
7	20	
8	8	
9	6	
10	20	
11	2	
12	20	
13	2	
Total	100/102	

Name \_\_\_\_\_

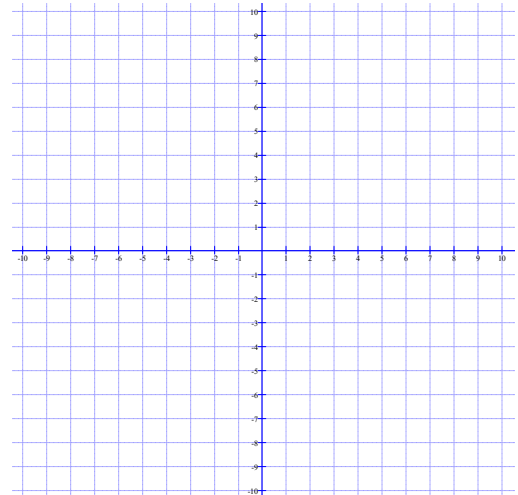
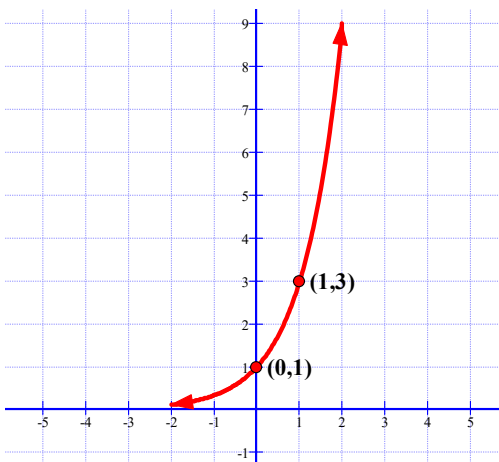
**Circle final answers**

1) (3 points each) Find the inverse of the following functions:

a)  $\{(8,4), (0,7), (12,9), (6,6)\}$

b)  $f(x) = \frac{2}{x-3}$

2) (5 points) Graph  $g(x) = 2 \cdot 3^{x+4} - 2$  by transforming the given function  $y = 3^x$ . Be sure to move and label the given points and asymptotes.



3) Extra credit (2 points) Find the inverse of the function  $g(x) = 2 \cdot 3^{x+4} - 2$ .

4) (3 points) Write as one logarithm  $9 \log_4 x + 5 \log_4 y - 10 \log_4 z$ :

5) (4 points) Given that  $\ln x = 5$ ,  $\ln y = 10$ , and  $\ln z = -5$ , find the exact value for  $\ln \sqrt[5]{\frac{x^4 y}{z^5}}$ :

6) (2 points each) Finish the explanation of the given equations. **Do not solve the equations.**

a)  $5^{4x-7} = 125$  is a one-to-one exponential equation because...

b)  $\log_{17}(2x+8) = 16$  is not a one-to-one logarithmic equation because...

7) (5 points each) Solve for the variable. Be sure to find the exact value.

a)  $8^{2x-1} = 16^{x+4}$

b)  $10e^{4x+1} = 13$

c)  $\log_2(x+1) - \log_2(x+2) = \log_2 8$

d)  $\ln(3x+4) + 3 = 12$

8) (4 points each) After drinking six espressos in one sitting, Mike's heartrate grew exponentially without bound. Using  $P(t) = P_0 e^{kt}$  where  $f$  is the heartrate in beats per minute and  $t$  is the number of minutes after he finished his 6<sup>th</sup> espresso...

a) Determine the exact value for the growth rate  $k$  if his initial heart rate was 63 beats per minute but grew to 127 beats per minute after 3 minutes.

b) Using the exact value of  $k$  from part a, determine Mike's heartrate after 10 minutes. Round to the nearest whole number:



*Mike was able to see a hummingbird slowly flap its wings around the 4<sup>th</sup> espresso.*

9) (2 points part *a*, 4 points part *b*) Consider the following problem.

Rub-A-Dub-Dub Candles make wonderfully scented, flammable products. Their biggest selling candles are called *Pine for the Good Days*, *What's That Smell?*, and *Pumpkin Spice Uggs*. On a particular day, a customer bought 3 *Pine*, 4 *Smell*, and 2 *Pumpkin* candles and spent \$63.55. A second customer bought 4 *Pine*, 1 *Smell*, and 5 *Pumpkin* candles and spent \$82.25. A third customer bought 6 *Smell* and 3 *Pumpkin* candles and spent \$60.45. What is the price of each candle?

a) Name and define variables:

b) Set up the system but **do not solve it**.

10) (10 points each) Solve the following system using the method listed:

a) Elimination:

$$\begin{cases} x - 4y + 2z = -4 \\ 4x - 15y + 8z = 2 \\ -2x + 9y - 10z = 8 \end{cases}$$

b) Gauss-Jordan Method:

11) (2 points) Verify that you made absolutely sure that your answer to 10a is the same as in 10b by signing your name here \_\_\_\_\_ . You will not receive the credit if the work does not support the same answer.

12) (10 points each) Decompose into partial fractions:

a)  $\frac{x+10}{x^2-4x-12}$

b)  $\frac{x^2+2x+7}{(x^2+2)(x+1)}$

13) (2 points) Short answer: Why are logarithms necessary?