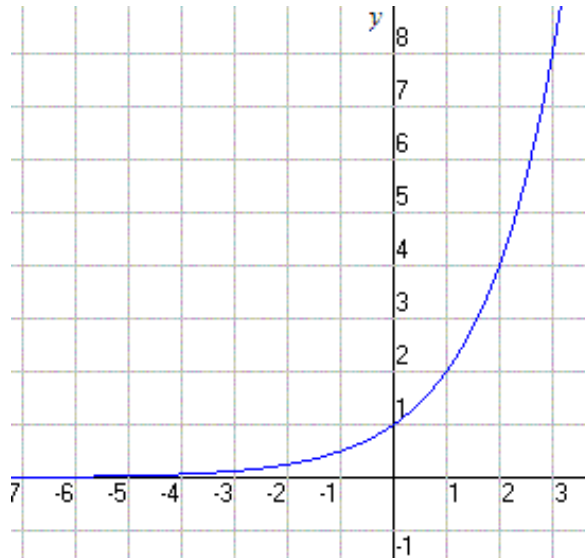**ASSIGNMENT**: Paper 4 Preview (Logarithmic and Exponential Functions)

1.) The graph of f(x) is displayed
    to the right.

a.) f(3) = _____

b.) f(x) = 1;   x = _____

c.) Write down the range of f(x).

_____

2.) The street legal Batmobile from the Michael Keaton Batman franchise costs $140,000. Due to its unique nature, this car actually appreciates in value by 5.3% per year. The Maybach 62S costs $500,000 but unfortunately is so common that it depreciates by 10.3% per year.

Colton can't be without either car, so he decides to buy both. What is the value differential after he graduates from college in 6 years?

Batmobile value: _____

Maybach value: _____   Difference: _____

3.)   Let $f(x) = \log_a x$, $x>0$.

   (a)   Write down the value of

        (i) $f(a)$;   _____

        (ii) $f(1)$;   _____

        (iii) $f(a^4)$.   _____   *[3 marks]*

4.) $7^{2x-1} = 343$ **5.)** $\log_{-2} x^2 = 4$ **6.)** $(¼)^x = 64^{x-1}$

Answer: _____   **Answer: _____**   **Answer: _____**

7.) As we learned in class, our Twinkle Twinkle little stars have apparent magnitude (brightness visible from Earth) and absolute magnitude (actual brightness exuded from the star). The equation is:

$m - M = \log (d/10)^5$

where "m" is the apparent magnitude, "M" is the absolute magnitude, and "d" is the number of parsecs from earth. 1 parsec = 3.26 light years.

Rho Ophiuchi is a nebulous cloud of dust that helps in star formation.

Rho Ophiuchi has an apparent magnitude of 5.0 and an absolute magnitude of –0.4. How many light years is Rho Ophiuchi from Earth?

You must show work to receive credit for this problem.

Answer: _____ (calculator necessary; remember S.F.)

8.) $\log 0.1 + \log 1 + \log 100$ **9.)** $\log_{1/3} 9 + \log_{1/3} 9^{1/3}$ **10.)** $13^{\log_{13} 13} - \log_{13} 13^{13}$

Answer: _____   Answer: _____   Answer: _____

11.) $e^{\ln x^3} = 27$ **12.)** $\ln e^{23}$ **13.)** $\ln x + \ln e = 1$

x = _____   Answer: _____   x = _____

14.) The function $r(x) = 2^x$ is transformed to $v(x) = -(2^{-x}) + e$. Describe each transformation. Remember that order matters with the + or − sign!

1: _____

2: _____

3. _____

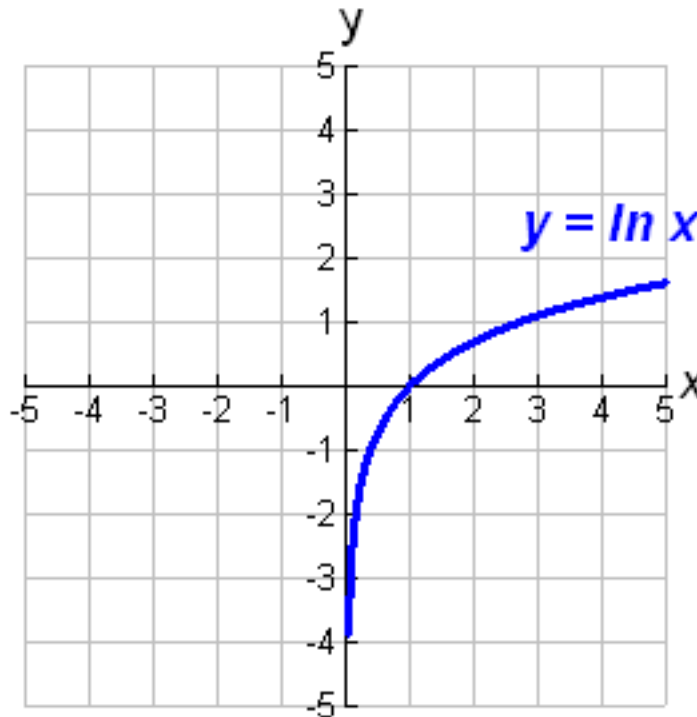**15.) How are exponential and logarithmic functions related? Use at least two complete sentences.**

_____

_____

_____

16.) The function f(x) = ln x is graphed below. Graph f⁻¹(x) on the same coordinate plane and identify the equation of that function.

$y = ln\ x$

17.) Scientists measure acidity in acid rain by analyzing the hydrogen ion concentration in moles per liter. Specifically, they can find the pH by utilizing the following formula: pH = –log [H⁺].

Which of the two water samples would you prefer and why?

0.0000716 H+ moles per liter

0.0000111 H+ moles per liter.

_____

_____

_____

_____

_____

_____

Answers (show all calculations or logic in order to receive credit):

2.) B: 190,852.68; M: 260,450.18

3.) 1, 0, 4

4.) x = 2

5.) x = 4

6.) x = 3/4

7.) 392 light years

8.) 1

9.) −8/3

10.) 0

11.) x = 3

12.) 23

13.) x = 1

14.) Multiple possible answers. Attend tutorials to check.

15.) Hint: $f(x) = f^{-1}(x)$

16.) Find the inverse

17.) Google "where is water on the pH scale" to get a better idea of what you would be drinking.