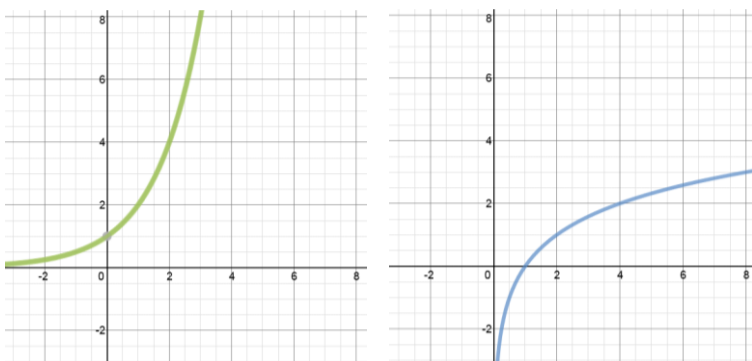**Math 3201**
**Review Sheet**
**Unit 7: Logarithmic Functions**

Name:_____ANSWERS_____          Due: Monday, May 4, 2015

*All questions are to be completed on this paper. Show all workings, where applicable.*

1. Given the graphs of $y = 2^x$ and $y = \log_2 x$, complete the following table.



|  | Exponential | Logarithmic |
| --- | --- | --- |
| Domain | $x \in R$ | $x > 0$ |
| Range | $y > 0$ | $y \in R$ |
| y-intercept | (0,1) | none |
| x-intercept | None | (1,0) |
| Increasing/decreasing | Increasing | Increasing |
| End behaviour | Q2 to Q1 | Q4 to Q1 |

2. What is $e^x = 18$ in logarithmic form?          2._____B____

(A)    $\ln x = 18$          (B)    $\ln x = 18$
(C)    $\log_x 18 = e$          (D)    $\log_{18} x = e$

3. What is $\log_2\left(\dfrac{1}{16}\right) = -4$ in exponential form?          3._____A____

(A)    $2^{-4} = \dfrac{1}{16}$          (B)    $\left(\dfrac{1}{16}\right)^{-4} = 2$

(C)    $(-4)^2 = \dfrac{1}{16}$          (C)    $\left(\dfrac{1}{16}\right)^2 = -4$

4. What is $2\log A + \log B - 5\log C$ expressed as a single logarithm?          4.___B_____

(A)    $\log(A^2 + B - C^5)$          (B)    $\log\left(\dfrac{A^2 B}{C^5}\right)$

(C)    $\log(2A + B - 5C)$          (D)    $\log\left(\dfrac{2AB}{5C}\right)$

1

5. Which is equivalent to $\log\left(\dfrac{A^3 B}{C^2}\right)$ ?

5._____C_____

(A) $3\log A - \log B + 2\log C$   (B) $3\log A + \log B - \log 2C$

(C) $3\log A + \log B - 2\log C$   (D) $\log 3A + \log B - \log 2C$

6. Write as a single logarithm: $2\log_6 3 + \log_6 4 - \log_6 8$.

6._____C_____

(A) $\log_6 2$   (B) $\log_6 3$

(C) $\log_6 \dfrac{9}{2}$   (D) $\log_6 5$

7. Which expression is equivalent to $\ln\dfrac{8}{5}$ ?

7._____A_____

(A) $\ln 8 - \ln 5$   (B) $\ln 5 - \ln 8$

(C) $8\ln 5$   (D) $\ln 0.625$

8. Which expression is equivalent to $\log 88$ ?

8._____B_____

(A) $\log 80 + \log 8$   (B) $\log 22 + \log 4$

(C) $\log 11 + \log 2$   (D) $\log 100 - \log 12$

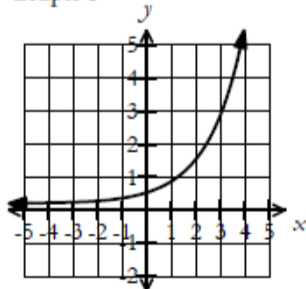9. What is the value of $x$, given $3^{x-1} = 14$ ?

9._____A_____

(A) $\dfrac{\log 14}{\log 3} + 1$   (B) $\dfrac{\log 14}{\log 3} - 1$

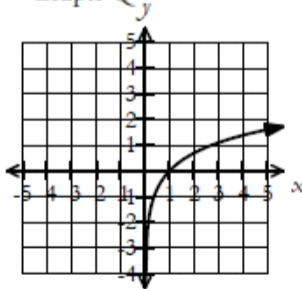(C) $\dfrac{\log 3}{\log 14} - 1$   (D) $\dfrac{\log 3}{\log 14} + 1$

10. Match each equation with its' corresponding graph.

| Equation I | $y = 3\left(\frac{1}{2}\right)^x$ | Equation II | $y = \frac{1}{3}(2)^x$ |
|---|---|---|---|
| Equation III | $y = \ln x$ | Equation IV | $y = -2\ln x$ |

Graph P



Graph Q



I___R____   II___P_____

III___Q____   IV____S___
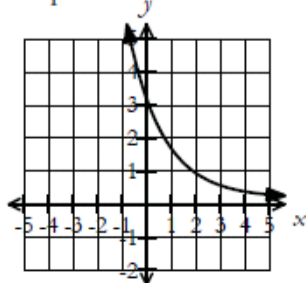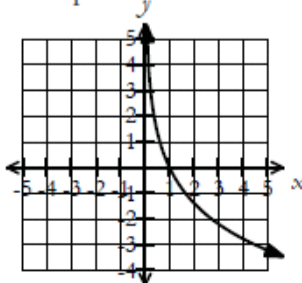
Graph R



Graph S

11. What is the value of $\log_5 125$ ?

<span style="color:red">y=3</span>

12. What is the value of $\log_6 25$ ?

<span style="color:red">**1.796**</span>

13. What is the value of $\log_2\left(\dfrac{1}{32}\right)$ ?

<span style="color:red">y = -5</span>

14. Solve for $x$: $2^x = 6$

<span style="color:red">**2.58**</span>

15. Evaluate: $\log_3 3 + 5\log_5 1$.

<span style="color:red">1</span>

16. Evaluate: $\log_2 16 - \log_2 32 + 2\log_2 4$.

<span style="color:red">**3**</span>

17. Write $\log_3 27 - \log_3 3 + 2\log_3\left(\dfrac{1}{9}\right)$ as a single logarithm and then evaluate.

<span style="color:red">$\log_3 \dfrac{9}{81} = $ -2</span>

18. Write $\log_4 5 + \dfrac{1}{2}\log_4 16 - \log_4 1.25$ as a single logarithm and then evaluate.

<span style="color:red">$\log_4 16 = 2$</span>

19. Solve for $x$: $4^{x+1} = 52$

<span style="color:red">x =1.85</span>

20. Solve for $x$: $2^{x+3} = 5^{2x-1}$

<span style="color:red">x =1.46</span>

21. The pH, $p(x)$, of a solution can be determined using the formula $p(x) = -\log x$, where the concentration of hydrogen ions, $x$, is measured in $mol/L$.

a) Calculate to the nearest tenth, the pH of a solution with a hydrogen ion concentration of $1.5 \times 10^{-6} mol/L$.

$$P(x) = 5.82$$

b) If the pH of the solution is 6.6, what is the concentration of the hydrogen ions?

$$x = 0.000000251$$

c) How much more acidic is a solution with a pH of 1.8 than a solution with a pH of 2.4? Round your answer to the nearest tenth.

**3.98**

22. The intensity of a fire alarm is $0.0015\ W/m^2$. What is the sound level to the nearest decibel using the formula: $\beta = 10(\log I + 12)$, where $\beta$ is the sound level in decibels and $I$ is the sound intensity in $W/m^2$ ?

91.76 db

23. Anne invests \$9000 in her grandchild's college fund. The fund grows at a rate of 8% per year compounded monthly. Algebraically determine how long will it take the fund to grow to \$20 000?

120 months = 10 years

24. The initial mass of cesium-137 is 700 mg. If it takes 84 years to decrease to 100 mg, algebraically determine the half-life. $A = A_0 \left(\dfrac{1}{2}\right)^{\frac{t}{h}}$

h = 30 years

25. Shane was asked to write the following as a single logarithm. His solution is shown below. Identify his mistakes and provide a correct solution:

$2\log_2 5 - \log_2\left(\dfrac{4}{5}\right) + \dfrac{1}{2}\log_2 16$     **error**

$\log_2 5^2 - \log_2\left(\dfrac{4}{5}\right) + \log_2\left(\dfrac{16}{2}\right)$        **Correct solution**

$\log_2 25 - \log_2\left(\dfrac{4}{5}\right) + \log_2 8$        $\log_2 125$

$\log_2\left(25 \times \dfrac{4}{5} \times 8\right)$

26. An advertising agency has determined that the number of items sold is related to the amount of money spent on advertising. A logarithmic regression was performed and the results were as follows:

$Ln \operatorname{Re} g$

$y = a + b\ln x$

$a = 1500$

$b = 315$

(a) Write the equation based on the result above.

$$y = 1500 + 315\ln x$$

(b) Use the equation to determine the number of items that will be sold if \$10 000 is spent on advertising.

$$y = 4401 \text{ items}$$