Math 120 **Lesson 4-4 Notes**

Logarithmic Functions

Topics

1) **Define logarithms.**
2) **Change between log form and exponential form.**
3) **Evaluate logs without a calculator.**
4) **Understand and use the basic log properties.**
5) **Graph log functions.**
6) **Identify the Domain of a log function.**
7) **Use common logs and natural logs.**

1) Define logarithms.

The log function asks the question:

2) Change between log form and exponential form.

$b^y = x$ **is interchangeable with** $\log_b x = y$

Write the equation in its equivalent exponential form.

1) $\log_2 8 = 3$

2) $\log_b 256 = 4$

3) $\log_5 125 = x$

Write the equation in its equivalent logarithmic form.

4) $3^{-2} = \frac{1}{9}$

5) $4^2 = x$

6) $\sqrt[3]{64} = 4$

Logarithmic Functions

3) Evaluate logs without a calculator.

7) $\log_{10}\sqrt{10}$

8) $\log_3 \frac{1}{27}$

9) $\log_{25} 5$

10) $\log_7 \frac{1}{\sqrt{7}}$

11) $\log_4 1$

11) $\log_4 1$

12) $\log_7 7$

13) $\log_3 3^{11}$

14) $\log\left(\frac{1}{10{,}000}\right)$

15) $2\log 10^{4.5}$

16) $\ln e$

4) Understand and use the basic log properties.

17) $9^{\log_9 10}$

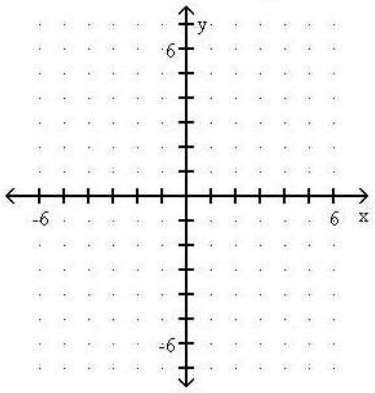
18) $10^{\log \sqrt[5]{x}}$

19) $e^{\ln 296}$

5) Graph log functions.

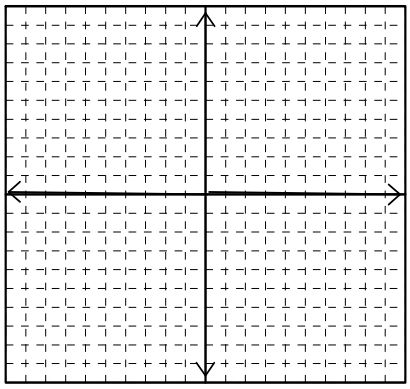
Graph the functions in the same rectangular coordinate system.

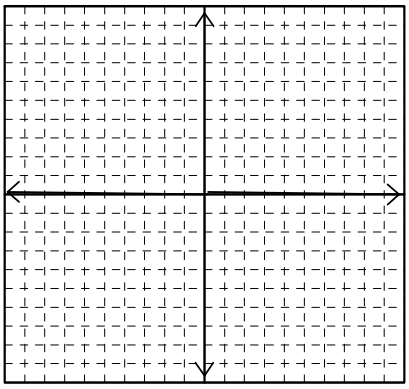
27) $f(x) = 2^x$ and $g(x) = \log_2 x$



Logarithmic Functions

The two basic logarithmic graphs:





All of the shifting rules work with these graphs.

6) Identify the Domain of a log function.

22) $f(x) = \log_2 (x - 9)$

23) $f(x) = \log_8 (x + 6)^2$

24) $f(x) = \log (x^2 - 17x + 72)$

Logarithmic Functions

7) Use common logs and natural logs.

20) The pH of a solution ranges from 0 to 14. An acid has a pH less than 7. Pure water is neutral and has a pH of 7. The pH of a solution is given by $pH = -\log x$ where x represents the concentration of the hydrogen ions in the solution in moles per liter. Find the pH if the hydrogen ion concentration is 1×10^{-4}.

21) The long jump record, in feet, at a particular school can be modeled by $f(x) = 20.4 + 2.1 \ln (x + 1)$ where x is the number of years since records began to be kept at the school. What is the record for the long jump 7 years after record started being kept? Round your answer to the nearest tenth.