Review Unit 8
Secondary III

Name: KEY
Date: _____ Class: _____

Write the Given exponential equation as a logarithmic equation

1. $4^2 = 16$ $\log_4 16 = 2$

2. $e^{17} = a$ $\ln a = 17$

3. $10^4 = 10{,}000$ $\log 10{,}000 = 4$

4. $b^p = a$ $\log_b a = p$

Write the Given logarithmic equation as an exponential equation

5. $\log_7 x = 10$ $7^{10} = x$

6. $\ln x = 32$ $e^{32} = x$

7. $\log 1000 = 3$ $10^3 = 1000$

8. $\log_\Delta \Phi = \Psi$ $\Delta^\Psi = \Phi$

9. if $f(x) = \log_5 x$, find $f(125), f\left(\frac{1}{25}\right), f(\sqrt{5})$

$Y = \log_5 125$
$5^Y = 125$
$Y = 3$

$Y = \log_5 \frac{1}{25}$
$5^Y = \frac{1}{25}$
$Y = -2$

$Y = \log_5 \sqrt{5}$
$5^x = \sqrt{5}$
$5^x = 5^{1/2}$
$x = 1/2$

10. The loudness L, measured in decibels, of a sound of intensity x, measured in watts per square meter is $L(x) = 10\log\frac{x}{10^{-12}}$. A Jet has an intensity level of 100 watts per square meter. How many decibels is a Jet?

$L(x) = 10\log\frac{100}{10^{-12}}$
$= 140$

140 decibels

Evaluate the following:

11. $\log_4 1$ $4^x = 1$ $x = 0$

12. $\ln e$ 1

13. $\log_5 5$ $5^x = 5$ $x = 1$

14. $7^{\log_7 12}$ 12

15. $\log_{12} 12^{15}$ 15

16. $\ln e^{32}$ 32

17. $10^{\log 14}$ 14

17. $\log_5 \sqrt{5}$ $5^x = \sqrt{5}$ $x = \frac{1}{2}$

Write each as a single logarithm. Assume that all variables are positive.

18. $3\log_4 2+\log_4 6$

$=\log_4 8+\log_4 6$

$=\boxed{\log_4 48}$

19. $\frac{1}{3}\log_7 y-6\log_7 z$

$=\log_7 y^{1/3}-\log_7 z^6$

$=\boxed{\log_7 \frac{\sqrt[3]{y}}{z^6}}$

20. $3\log_2 x+\frac{1}{2}\log_2 y-2\log(xz)$

$=\log_2 x^3+\log_2 \sqrt{y}-\log(xz)^2$

$=\boxed{\log_2 x^3\sqrt{y}-\log(xz)^2}$

Use the properties of logarithms to expand the following. Express all exponents as coefficients.

21. $\log_3 x^2y^4$

$=\log_3 x^2+\log_3 y^4$

$=\boxed{2\log_3 x+4\log_3 y}$

22. $\log_{12}\frac{\sqrt{x}}{y^2}$

$=\log_{12}\sqrt{x}-\log_{12} y^2$

$=\boxed{\frac{1}{2}\log_{12} x-2\log_{12} y}$

23. $\log_4 \frac{x\sqrt{y}}{z^{12}w^2}$

$=\log_4 x\sqrt{y}-\log_4 z^{12}w^2$

$=\log_4 x+\log_4\sqrt{y}-\log_4 z^{12}+\log_4 w^2$

$=\boxed{\log_4 x+\frac{1}{2}\log_4 y-12\log_4 z+2\log_4 w}$

Use the Change-of-Base to write the following in only natural logarithms. Then use your calculator to evaluate each.

24. $\log_5 3$

$\frac{\ln 3}{\ln 5}\approx 0.6826$

25. $\log_{12} 13$

$\frac{\ln 13}{\ln 12}\approx 1.032$

26. $\log 80000$

$\frac{\ln 80000}{\ln 10}\approx 4.903$

Solve the following. Round your answer to the nearest hundredth. Check for extraneous solutions.

27. $4^{2x+10}+6=262$

$\log 4^{2x+10}=\log 256$

$2x+10\log 4=\log 256$

$\frac{2x+10}{2\log 4}=\frac{\log 256}{2\log 4}$

$x+5=\frac{\log 256}{\log 4}$

$x+5=4$

$\boxed{x=-1}$

$x=\frac{\log 256}{\log 4}-10$

$\boxed{x=-3}$

28. $\frac{7e^{\frac{x}{4}}}{7}=\frac{500}{7}$

$\ln e^{\frac{x}{4}}=\ln\frac{500}{7}$

$\frac{x}{4}=\ln\frac{500}{7}\cdot 4$

$\boxed{x=17.07}$

29. $\log_2 x-\log_2 3=4$

$\log_2\frac{x}{3}=4$

$2^4=\frac{x}{3}$

$3\cdot 16=\frac{x}{3}\cdot 3$

$\boxed{x=48}$

30. $\ln(x+2)+\ln(x+3)=\ln 30$

$\ln(x+2)(x+3)=\ln 30$

$(x+2)(x+3)=30$

$x^2+5x+6=30$

$x^2+5x-24=0$

$(x-3)(x+8)=0$

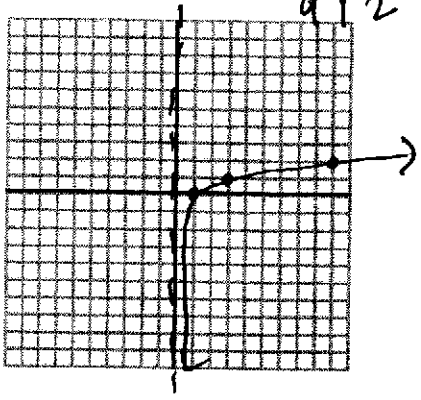
$x=3,-8$

$\boxed{x=3}$

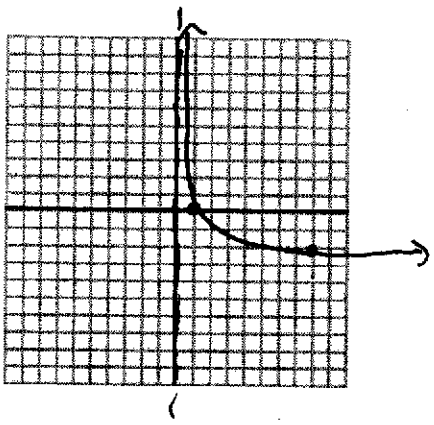
Graph the Following label at least 2 points:

31. $f(x)=\log_3 x$

x	y
1	0
3	1
9	2

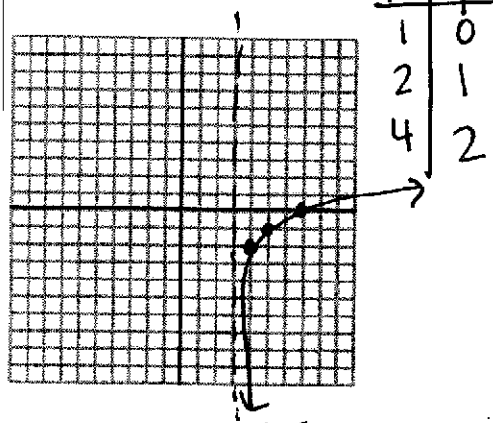


32. $f(x)=-\ln x$

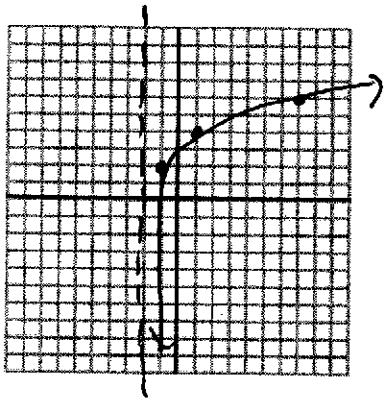


33. $f(x)=\log_2(x-3)-2$

x	y
1	0
2	1
4	2



34. $f(x)=2\log_3(x+2)+2$



x	y
1	$0\cdot 2=0$
3	$1\cdot 2=2$
9	$2\cdot 2=4$

35. The pH of ~~orange juice~~ is 3.2, and the pH of milk is 6.1.

$pH=-\log[H^+]$

A. What are the hydrogen-ion concentrations of seawater and milk of magnesia?

seawater: $3.2=-\log[H^+]$ $\quad 10^{-3.2}=[H^+]$

Milk: $6.1=-\log[H^+]$ $\quad 10^{-6.1}=[H^+]$

B. How many times greater is the hydrogen-ion concentration of the seawater than that of milk of magnesia?

$$\frac{[H^+]\text{ seawater}}{[H^+]\text{ Milk}}=\frac{10^{-3.2}}{10^{-6.1}}=10^{2.9}\text{ times greater}$$

36. If Bob invests \$5,000 with a 4% interest rate compounded monthly, how long will it take until his investment has grown to \$7,000?

$7000=5000\left(1+\frac{.04}{12}\right)^{12t}$

$7000=5000(1.00333)^{12t}$

$\frac{7}{5}=(1.00333)^{12t}$

$\ln\frac{7}{5}=\ln 1.00333^{12t}$

$\ln\frac{7}{5}=12t\ln 1.00333$

$\frac{\ln\frac{7}{5}}{12\ln 1.00333}=t$

$t\approx 0.43$ yrs

37. Find the amount accumulated from an investment of \$2,000 over 15 years at an interest rate of 6.2% compounded continuously.

$A(t)=2000e^{.062(15)}$

$=\$5069.02$