1. Use the graph and table of $f(x) = 10^x$ below to solve the following equations.

a) $10^x = 100$ b) $10^x = 10$ c) $10^x = 50$

Graph of $f(x) = 10^x$

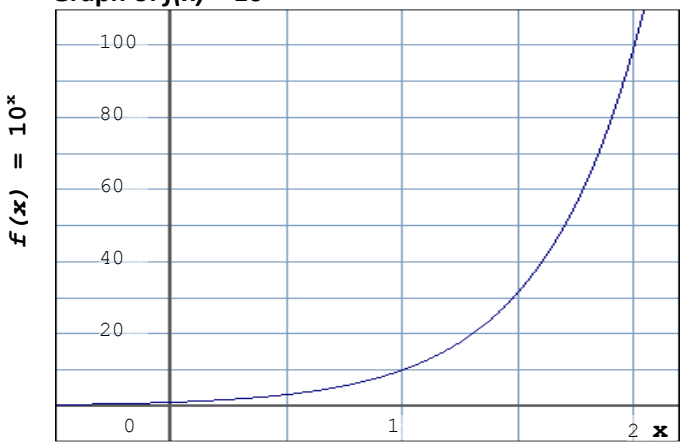


Table of $f(x) = 10^x$

x	$f(x) = 10^x$
-2	0.01
-1	0.1
0	1
1	10
2	100
3	1000

Table of $f^{-1}(x)$

x	$f^{-1}(x)$
0.01	-2
0.1	-1
1	0
10	1
100	2
1000	3

2. How would you describe $f^{-1}(x)$ in words?

3. You can use your calculator to evaluate base 10 logarithms. The calculator abbreviates $\log_{10}$ as LOG. Use your calculator to evaluate the following expressions.

a) $\log_{10}(100)$ b) $\log_{10}(10)$ c) $\log_{10}(1{,}000{,}000)$

d) $\log_{10}(\sqrt{10})$ e) $\log_{10}(\sqrt[3]{10})$ f) $\log_{10}((\sqrt[5]{10})$

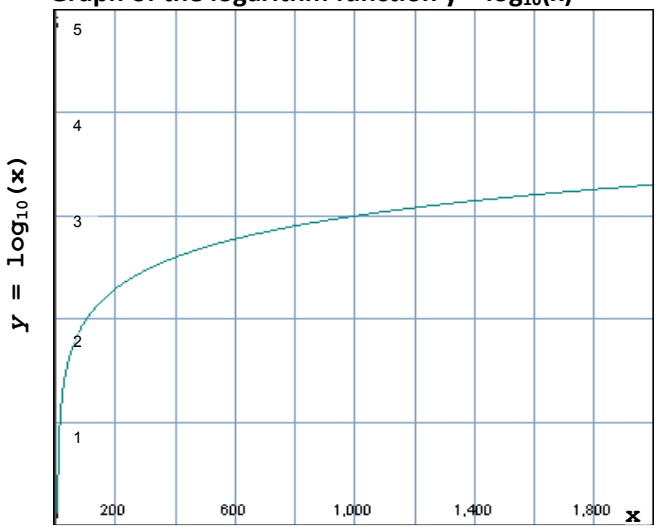
g) What patterns do you notice? How would you explain what a logarithm is?

Definition: The function $f^{-1}(x)$ where $f(x) = 10^x$ is called the logarithm function with base 10.

That is, $f^{-1}(x) = \log_{10}(x)$. It is read, "log base 10 of x".

In other words, if $10^a = x$, then $\log_{10}(x)$ = _____.

Graph of the logarithm function $y = \log_{10}(x)$



4. Test your understanding of the logarithm function.

a) Explain why $\log_{10}(600)$ is between 2 and 3.

b) Find a value for x that makes the following statement true: $3 < \log_{10}(x) < 4$. Explain why your answer makes sense.

5. Make predictions by filling in the blank. Check your answers on your calculator.

a) $\log_{10}(100) = 2$ so $10^2 =$ _____

b) $\log_{10}(300) \approx 2.47712125471967$ so $10^{2.47712125471967} \approx$ _____

c) $\log_{10}(1400) \approx 3.14612803567823$ so $10^{3.14612803567823} \approx$ _____

In General: If $\log_{10}$ (_____) = x, then $10^{(\_\_)} = y$

6. Write the following expressions in equivalent exponential or logarithmic form.

Exponential Equation Form	Equivalent Logarithmic Equation Form
$10^x = 50$	_____
$10^{3x} = 98.3$	_____
_____	$\log_{10}(x) = 5.26$

Logarithms are not limited to base 10 – **logs can have any base b**, where b > 0 and b≠ 1.

That is, $y = \log_b x$ means $x =$ _____^{y}

$\log_b x$ and b^x are inverse functions so logarithms have the following properties

1. $\log_b 1 = 0$ 2. $\log_b b^x =$ _____ 3. $b^{\log_b x} =$ _____

7. Write the following expressions in equivalent exponential or logarithmic form.

Exponential Equation Form	Equivalent Logarithmic Equation Form
$6^2 = 36$	$\log_6 36 = 2$
$5^3 = 125$	_____
$3^{-4} = \frac{1}{81}$	_____
_____	$\log_2 32 = 5$
_____	$\log_3 x = 4$ (Can you figure out what x is?)
_____	$\log_7 \sqrt{7} = ½$

8. Find the value of each logarithmic expression

a) $\log_2 8$ b)$\log_9 9$ c) $\log_{25}5$ d) $5^{\log_5 7}$

9. Solve each equation for x

a) $\log_3 9 = x$ b)$\log_x 8 = 3$ c) $\log_4\frac{1}{16} = x$ d) $\log_x 100 = 2$