

Example: $10^1 = \underline{10}$
 $10^x = 85$
 $10^2 = \underline{100}$

Exponential Form	VS	Logarithmic Form
$10^3 = 1000$		$\log_{10} 1000 = 3$

For any positive base b , where $b \neq 1$: $b^x = y$ if and only if $x = \log_b y$

Examples

Write each equation in logarithmic form.

1. $5^3 = 125$ $\log_5 125 = 3$ 2. $\left(\frac{1}{2}\right)^{-3} = 8$ $\log_{\frac{1}{2}} 8 = -3$

Write each equation in exponential form.

3. $\log_3 81 = 4$ $3^4 = 81$ 4. $\log_4 \frac{1}{16} = -2$ $4^{-2} = \frac{1}{16}$

You can evaluate logarithms with a base of 10 by using the log key on your calculator.

Solve each equation for x . Round your answers to the nearest hundredth.

5. $10^x = 85$ $\log_{10} 85 = x$ 6. $10^x = \frac{1}{109}$ $\log_{10} \frac{1}{109} = x$
1.93 -2.04

One-to One Property of Exponent
If $b^x = b^y$ then $x = y$

$9^{\frac{1}{2}} = \sqrt{9} = 3$ $4^{-3} = \frac{1}{4^3} = \frac{1}{64}$ $m^{\frac{1}{n}} = \sqrt[n]{m}$ $\left(\frac{1}{2}\right)^{-4} = 2^4 = 16$

Find the value of v in each equation. **DO NOT USE A CALCULATOR!!!!**

7. $4 = \log_3 v$ 8. $5 = \log_v 32$ 9. $\frac{1}{2} = \log_9 v$ 10. $-2 = \log_6 v$
 $3^4 = v$ $v^5 = 32$ $9^{1/2} = v$ $6^{-2} = v$
 $v = 81$ $v^5 = 2^5$ $v = 3$ $\frac{1}{6^2} = \frac{1}{36} = v$
11. $\log_v 4 = \frac{1}{2}$ 12. $v = \log_{125} 5$ 13. $\log_{10} 0.001 = v$ 14. evaluate $\log_4 \sqrt{2} = x$
 $v^{1/2} = 4$ $125^v = 5$ $10^v = .001$ $4^x = \sqrt{2}$
 $\sqrt{v} = 4$ $5^{3v} = 5^1$ $10^v = \frac{1}{1000}$ $2^{2x} = 2^{1/2}$
 $v = 16$ $3v = 1$ $v = -3$ $x = \frac{1}{4}$

15. Graph $y=3^x$ and $y=\log_3 x$ on the same grid.

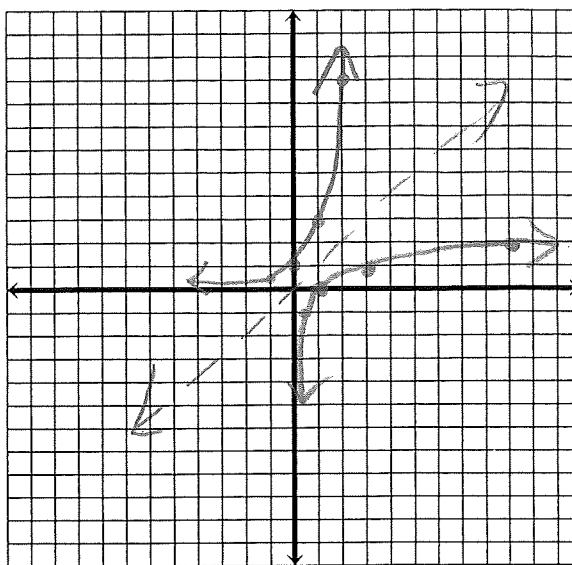
$y=3^x$

$y=\log_3 x$

$3^y = x$

x	y
-1	1/3
0	1
1	3
2	9

x	y
1/3	-1
1	0
3	1
9	2



Domain: all real numbers Domain: $x > 0$

Range: $y > 0$ Range: all real numbers

Exponential functions and logarithmic functions are inverses of each other.

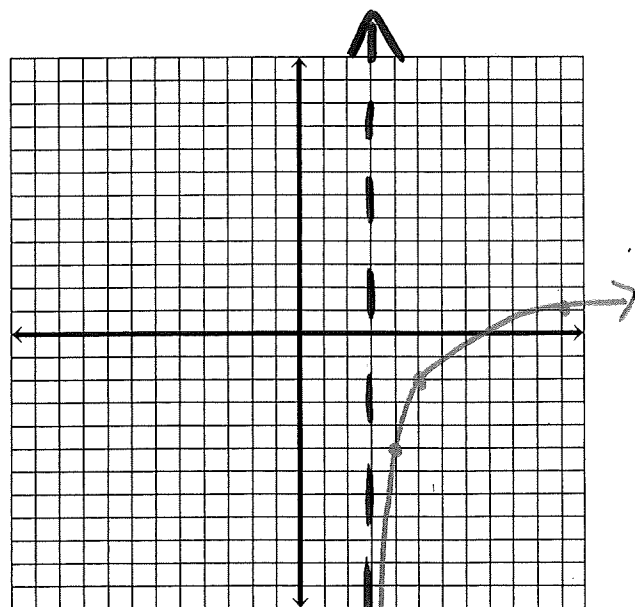
Their graphs are a reflection across the line $y=x$

$y = 3 \log_3 \left(\frac{1}{3}(x-3) \right) - 2$

16. Graph $y = 3 \log_3 \left(\frac{1}{3}x - 1 \right) - 2$

$3^y = x$

Type:		$x-3$		$x+3$		$y-3$		$y-2$	
x	y	x	y	x	y	x	y	x	y
1/3	-1	1		4		-3	4	-5	
1	0	3		6		0	6	-2	
3	1	9		12		3	12	1	
9	2	27		30		6	30	4	



$x-3=0$

$x=3$

domain: $x > 3$

$x=3$

range: all real numbers