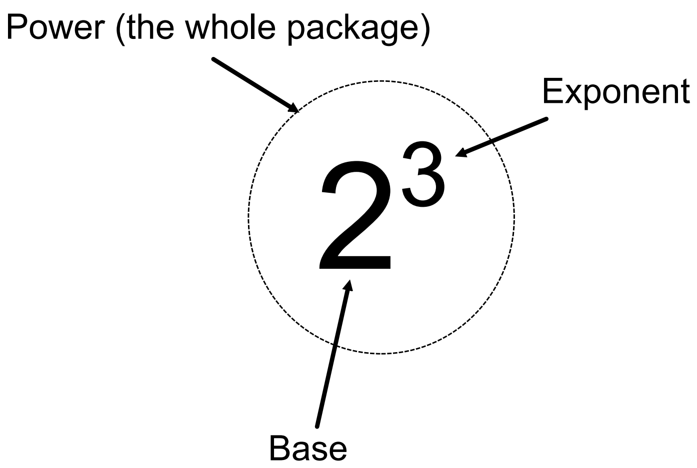
Exponents and Exponent Rules

Terminology



Feb 23-9:05 AM

Standard Form and Expanded Form

2^3	2 x 2 x 2
5^4	5 x 5 x 5 x 5
$(-3)^2$	(-3) x (-3)
$(a+5)^3$	(a+5) x (a+5) x (a+5)

Feb 23-9:08 AM

Basic Exponent Rules

$3^4 \times 3^5$ $a^m \times a^n = a^{m+n}$

$\frac{2^5}{2^3}$ $\frac{a^m}{a^n} = a^{m-n}$

$\left(2^3\right)^2$ $\left(a^m\right)^n = a^{mn}$

$\left(\frac{3}{2}\right)^3$ $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

Sep 5-2:07 PM

Mixed Term Operations

Simplify

$(2^3)(a^5)(2^4)(a^3)$

Note:

Feb 23-9:32 AM

Simplify

$$\frac{5^4a^6b^8}{5^2a^4b^7}$$

=

Feb 23-9:37 AM

The ZERO Exponent Rule

$$\frac{27}{27}=\frac{3^3}{3^3} \longrightarrow \frac{27}{27}=3^{3-3}$$

$$\downarrow \qquad\qquad \downarrow$$

$$\frac{27}{27}=1 \longrightarrow \frac{27}{27}=3^0$$

$$a^0=1$$

$$(a^2+4b)^0=1$$

Feb 23-9:50 PM

The NEGATIVE Exponent Rule

By patterning....

$2^4 =$

$2^3 =$

$2^2 =$

$2^1 =$

$2^0 =$

$2^{-1} =$

$2^{-2} =$

$$a^{-n} = \frac{1}{a^n}$$

Feb 23-9:45 PM

Rational Exponents

$$\sqrt[3]{8} =$$

$$\sqrt[n]{a} = a^{\frac{1}{n}}$$

Sep 19-9:34 AM

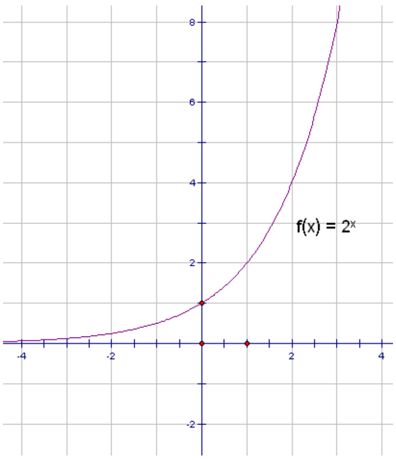
$27^{\frac{-2}{3}}$ or $27^{\frac{-2}{3}}$

Sep 19-9:50 AM

Sec 8.1 and 8.2

The logarithmic function

Recall the exponential function: $y = a^x$



X	Y
-2	
-1	
0	
1	
2	

What about the inverse though?

Graph the inverse on the same grid.

Dec 31-1:44 PM

To find the inverse of a function, switch the x and y variables

So... $y = 2^x$ becomes $x = 2^y$

We need to rearrange to put in function notation, but we don't have an operation to do this... so we invented LOGARITHMS

$x = 2^y$ is written $y = \log_2 x$

Dec 31-1:56 PM

Remember

$x = 2^y$ is written $y = \log_2 x$

$$y = \log_2 x$$

"2" to the exponent "y" = "x"

Dec 31-2:42 PM

How do we use this?

Ex:

Evaluate:

$\log_3 27$ = x

$\log_4 16$ = x

$\log_4 1$ = x

$\log_2 \frac{1}{4}$ = x

May 22-11:31 AM

Graphing logarithms

$y = \log_a x$ This is the base function. "a" is the base and determines the steepness of the curve.

The domain of a log function is x>0
The range of a log function is $y \in \mathbb{R}$

Graph:

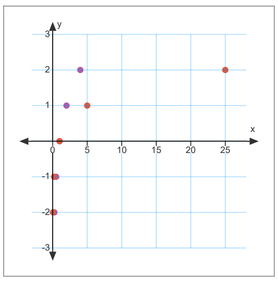
$f(x) = \log_2 x$ and $g(x) = \log_5 x$

f(x)

X	Y
0.25	-2
0.5	-1
1	0
2	1
4	2

g(x)

X	Y
$\frac{1}{25}$ 0.04	-2
$\frac{1}{5}$ 0.2	-1
1	0
5	1
25	2



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Translations of log functions are just like every other function that we have learned so far...

$$f(x) = a\log_{10}(k(x-d)) + c$$

transformed logs.gsp

Dec 31-2:18 PM

Homework:
p451 #5,6,7,9
p457 #1,3,4i,ii

Dec 31-2:43 PM

Attachments

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