

4.2. Logarithmic (Log) Functions

Tuesday, November 10, 2019

10:37 AM

Obj 1: Definition of the Logarithmic function.

Let b be a constant, b is positive ($b > 0$);
 $b \neq 1$.

The function $y = f(x) = \log_b x$ (read as **log base b of x**) is called the logarithmic function with base b .

What does it do?

$\log_b x$ gives us the **exponent** y such that

$$b^y = x$$

In other words,

$\log_{\boxed{b}} \boxed{x} = \boxed{y}$ is equivalent to $b^y = x$

base (pointing to b)

number (pointing to x)

exponent (pointing to y)

(read as log base 2 of x)

E.g. $b=2$. Consider function $f(x) = \log_2 x$

$$f(4) = \log_2 4 = 2 \quad (\text{because } 2^2 = 4)$$

Diagram annotations for $f(4) = \log_2 4 = 2$:

- A green box around the base 2 is labeled "base".
- A black box around the number 4 is labeled "number".
- A red box around the result 2 is labeled "exponent".
- A pink arrow points from the "number" label to the 4.
- A green arrow points from the "base" label to the 2.
- A red arrow points from the "exponent" label to the 2.

$$f(8) = \log_2 8 = 3 \quad (\text{because } 2^3 = 8)$$

Diagram annotations for $f(8) = \log_2 8 = 3$:

- A green box around the base 2 is labeled "base".
- A black box around the number 8 is labeled "number".
- A red box around the result 3 is labeled "exponent".
- A pink arrow points from the "number" label to the 8.
- A green arrow points from the "base" label to the 2.
- A red arrow points from the "exponent" label to the 3.

$$f(16) = \log_2 16 = 4 \quad (\text{because } 2^4 = 16)$$

Diagram annotations for $f(16) = \log_2 16 = 4$:

- A red box around the result 4 is labeled "exponent".

$$f(32) = \log_2 32 = 5 \quad (\text{because } 2^5 = 32)$$

Diagram annotations for $f(32) = \log_2 32 = 5$:

- A red box around the result 5 is labeled "exponent".