

The Logarithm Function



Preliminaries and Objectives

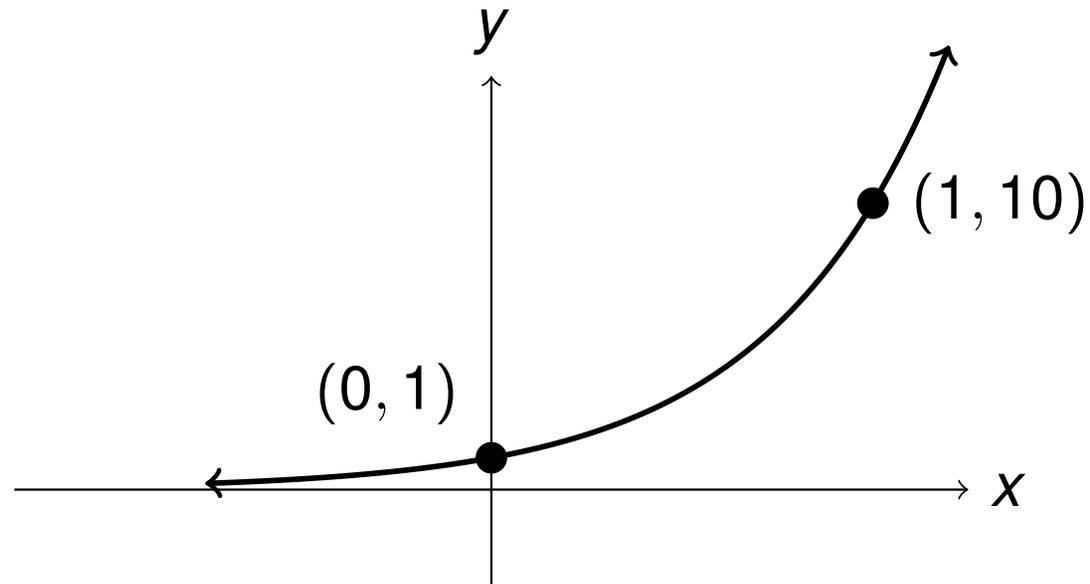
Preliminaries

- Exponential functions
- Inverse functions and their graphs

Objectives

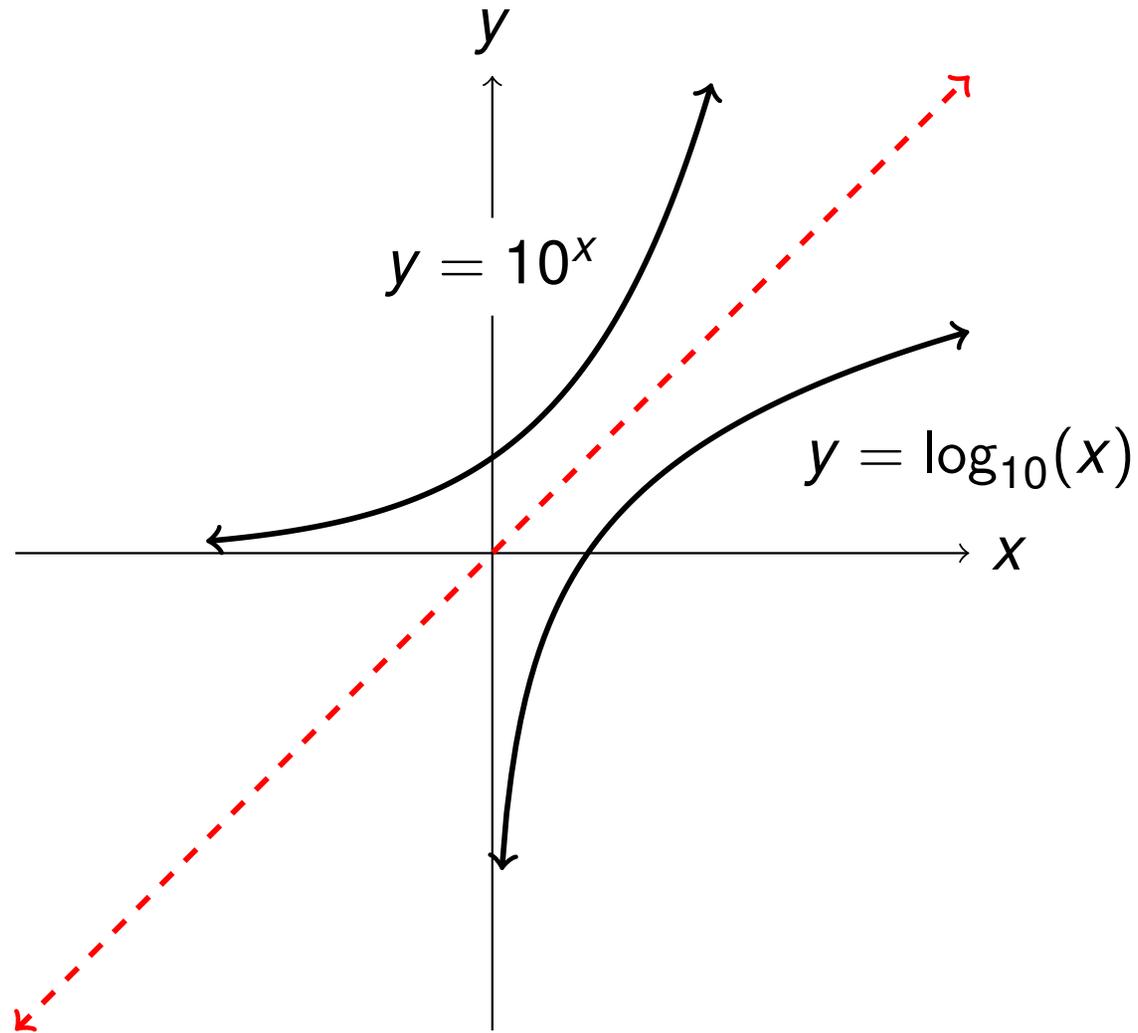
- Write exponential equations in logarithmic form
- Understand properties of the graphs of logarithmic functions

$$y = 10^x$$



- increasing
- goes through $(0, 1)$
- approaches x -axis to the left
- bends upward
- Domain : \mathbb{R}
- Range : $y > 0$

$y = 10^x$ and $y = \log(x)$

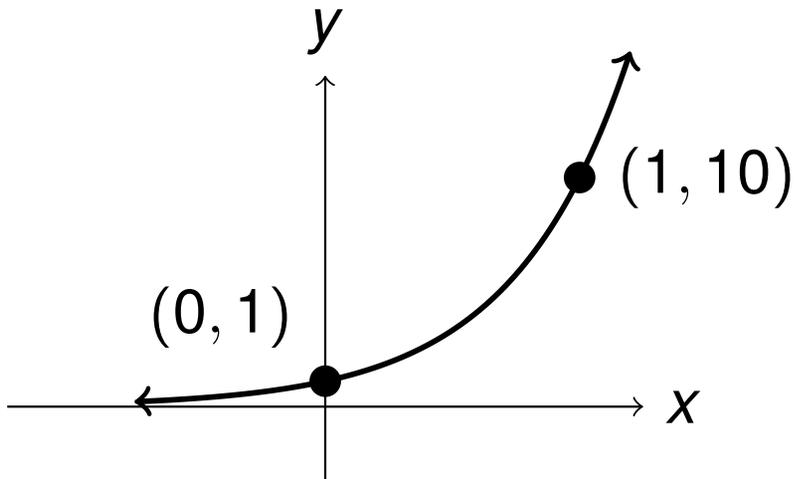


Example 1

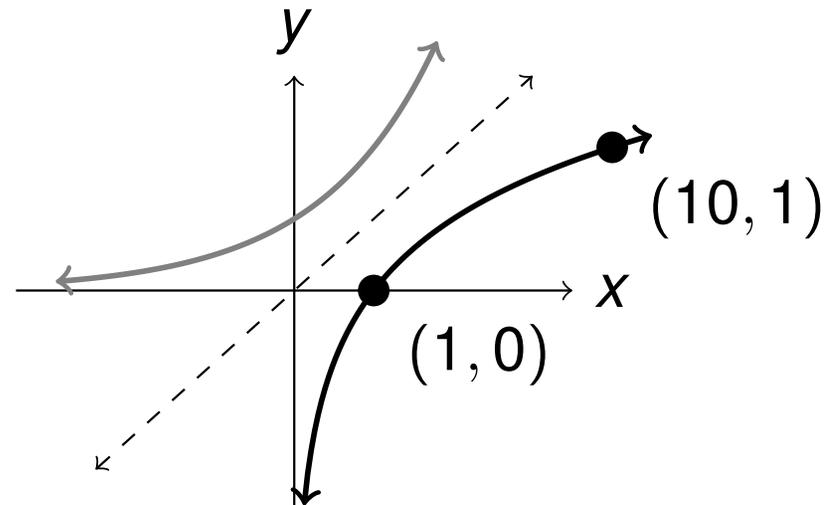
$$\log_{10} 1000 = y$$

$$10^y = 1000$$

Inverse of $y = 10^x$



- increasing
- goes through $(0, 1)$
- approaches x -axis to the left
- bends upward
- Domain : \mathbb{R}
- Range : $y > 0$



- increasing
- goes through $(1, 0)$
- approaches y -axis downward
- bends to the right
- Domain : $x > 0$
- Range : \mathbb{R}

Example 2

$$\log_2 8 = 3$$

$$2^3 = 8$$

$$\log_b 4 = x$$

$$b^x = 4$$

Example 3

Find the exact value of x without using a calculator

$$\log_2 1 = x \quad \rightarrow \quad 2^x = 1 \quad \rightarrow \quad x = 0$$

$$\log_8 8 = x \quad \rightarrow \quad 8^x = 8 \quad \rightarrow \quad x = 1$$

$$\log_5 25 = x \quad \rightarrow \quad 5^x = 25 \quad \rightarrow \quad x = 2$$

$$\log_{10} \sqrt{10} = x \quad \rightarrow \quad 10^x = 10^{\frac{1}{2}} \quad \rightarrow \quad x = \frac{1}{2}$$

$$\log_7 \sqrt[3]{49} = x \quad \rightarrow \quad 7^x = (49)^{\frac{1}{3}} = (7^2)^{\frac{1}{3}} \quad \rightarrow \quad x = \frac{2}{3}$$