# EXPONENTIAL AND LOG GRAPHS INCREASING AND DECREASING

# REVISION DEFINITION OF A LOG

- The inverse of an exponent is a log

Exponential equation:

$x = a^y$

Interchange x and y for inverse:

$y = a^x$

Log equation:

$y = log_a x \qquad \text{where } a, y > 0 \text{ and } a \neq 1$

# Examples: Converting between exponential and log forms

Write in log form:

1. $y = 5^x$

   $x = 5^y$

   $y = log_5 x$

2. $y = 3^{-x}$

   $y = \left(\frac{1}{3}\right)^x$

   $x = \left(\frac{1}{3}\right)^y$

   $y = log_{\frac{1}{3}} x$

- First interchange x and y
- The base of the exponent becomes the base of the log

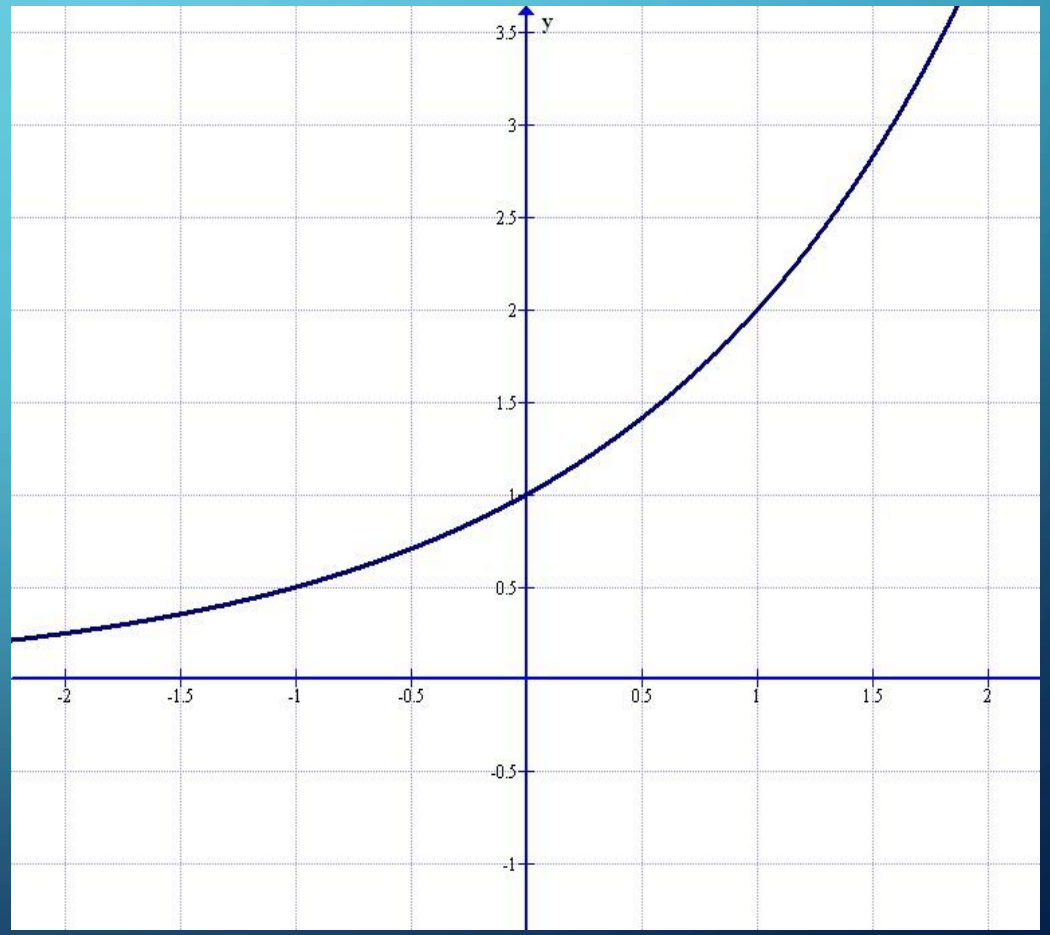
# SKETCHING EXPONENTIAL AND LOG GRAPHS

## Increasing exponential graph: $f(x)$: $y = 2^x$

- No x-intercept as

  asymptote at y = 0

- y-int: $y = 2^0 = 1$
- Domain: $x \in R$
- Range: $y > 0$



# SKETCHING EXPONENTIAL AND LOG GRAPHS

## Increasing log graph: $f(x)$: $y = log_2 x$

- No y-intercept as

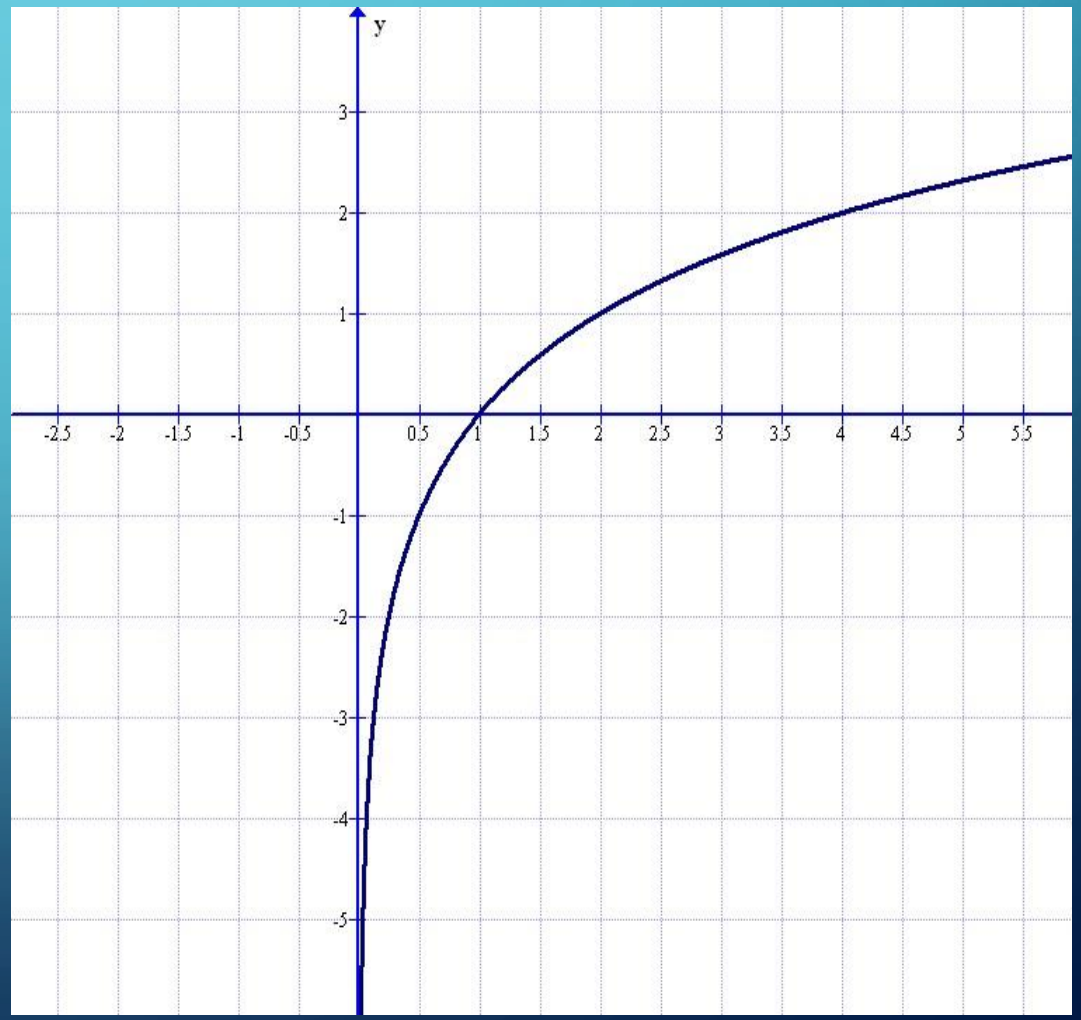
  asymptote at x = 0

- x-int: $0 = log_2 x$

  $x = 2^0 = 1$

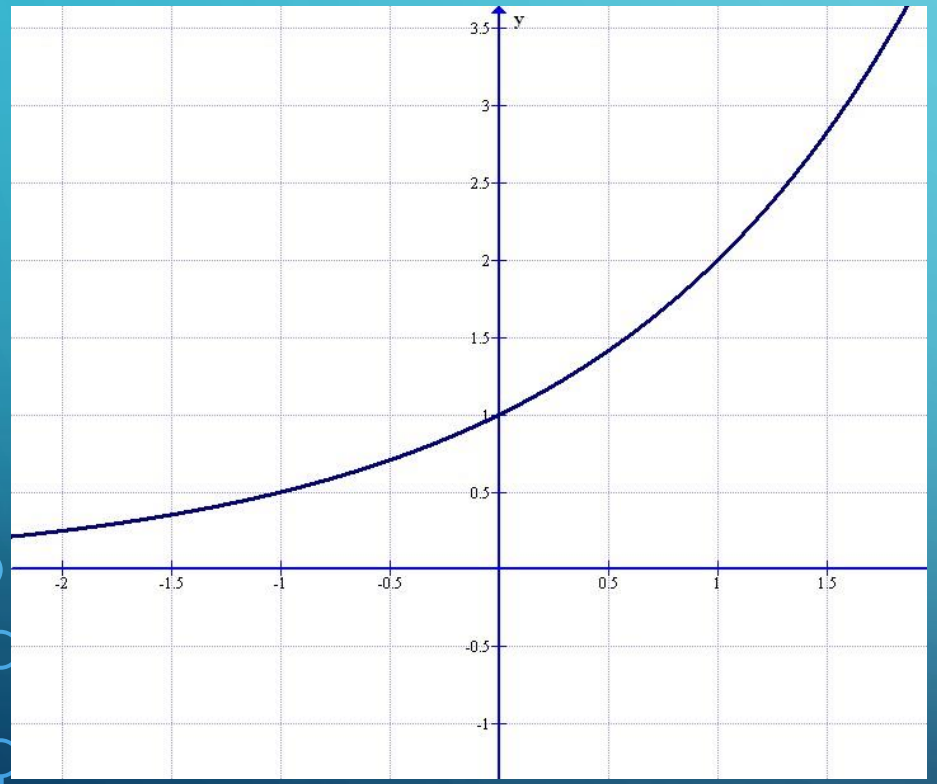
- Domain: $x > 0$

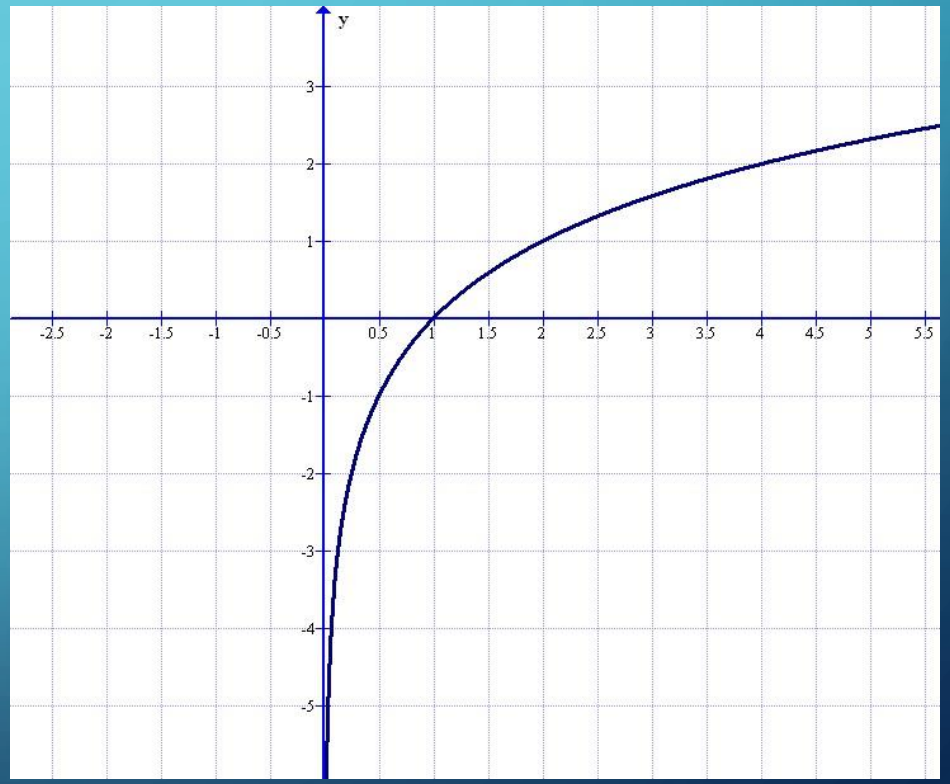
- Range: $y \in R$



Increasing Exponential
Graph: $y = 2^x$

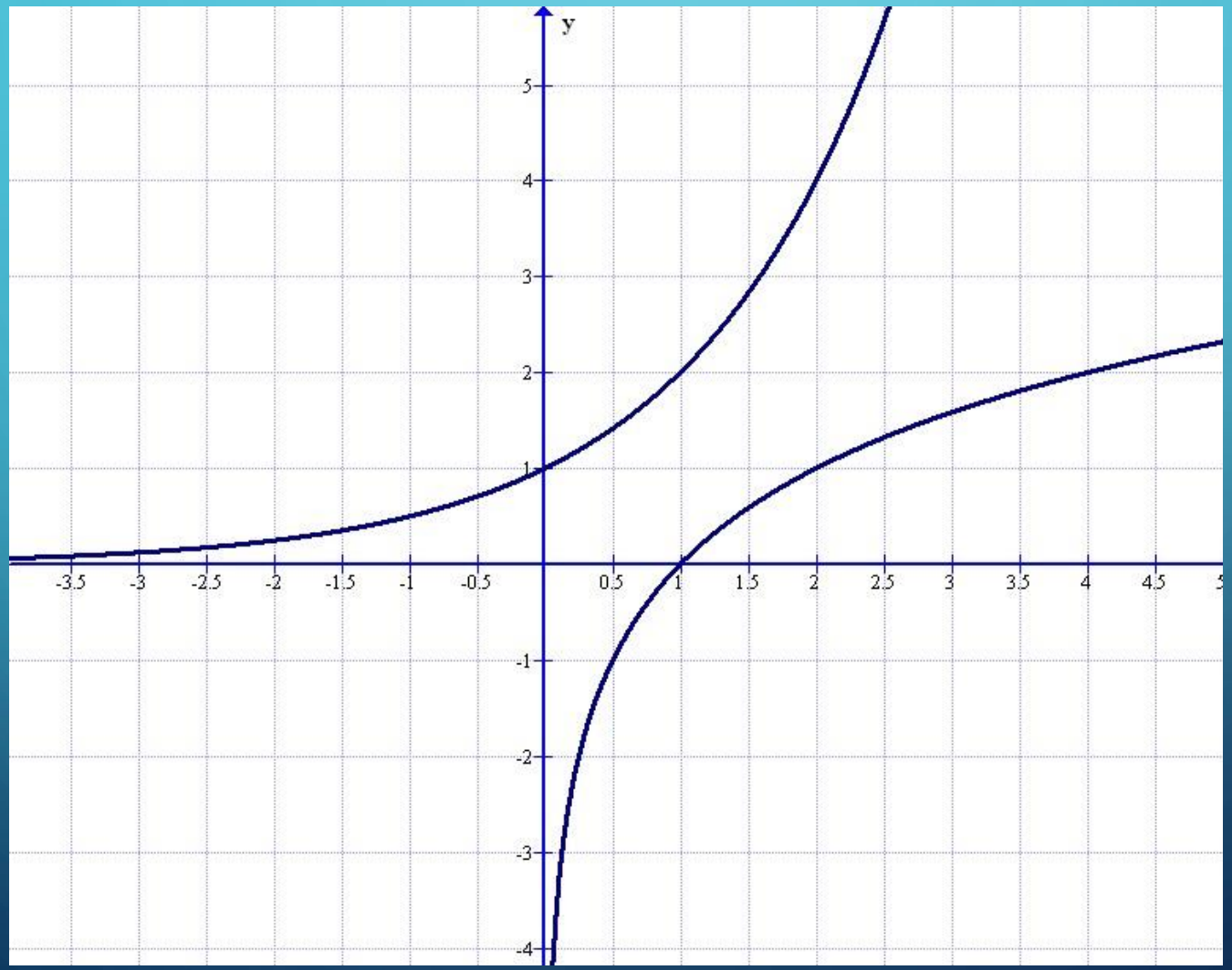
Increasing Log
Graph: $y = \log_2 x$




Together ….

# INCREASING EXPONENTIAL AND LOG GRAPHS ….



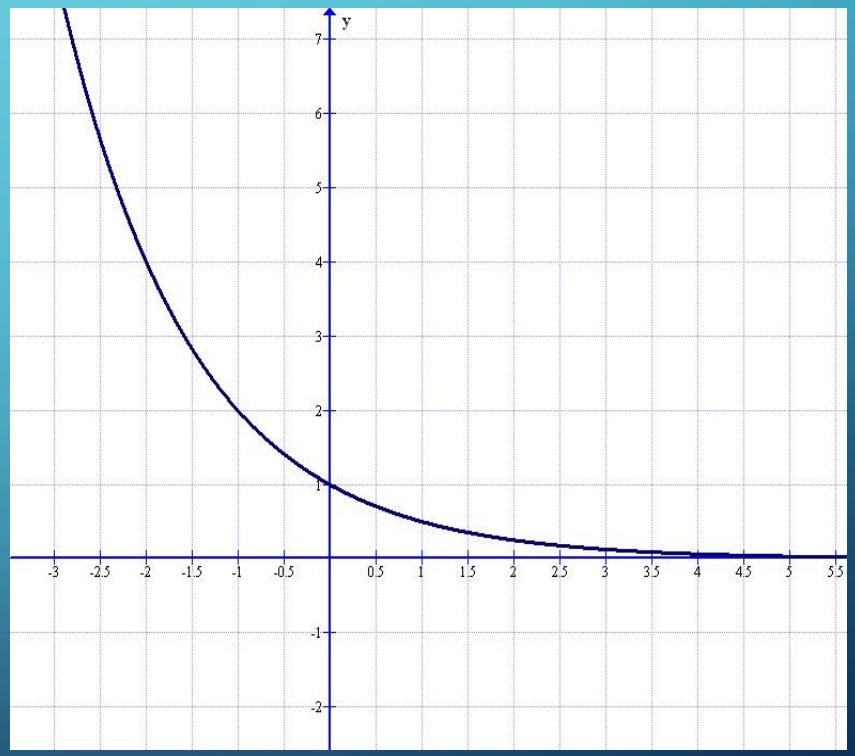
# SKETCHING EXPONENTIAL AND LOG GRAPHS

## Decreasing exponential graph: $f(x)$: $y = (\frac{1}{2})^x$

- No x-intercept as

  asymptote at y = 0

- y-int: $y = \left(\frac{1}{2}\right)^0 = 1$
- Domain: $x \in R$
- Range: $y > 0$



# SKETCHING EXPONENTIAL AND LOG GRAPHS

## Decreasing log graph: $f(x)$: $y = log_{\frac{1}{2}}x$

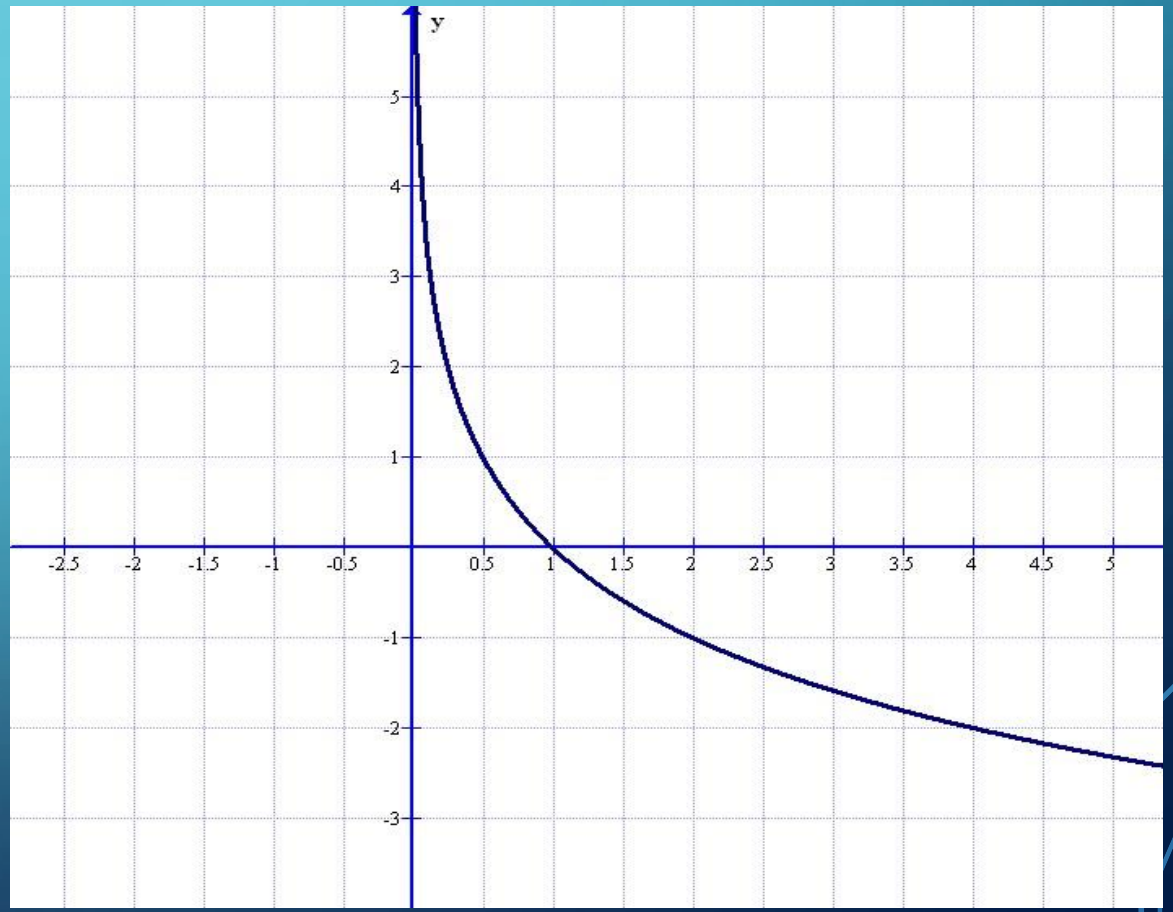
- No y-intercept as

  asymptote at x = 0

- x-int: $0 = log_{\frac{1}{2}} x$

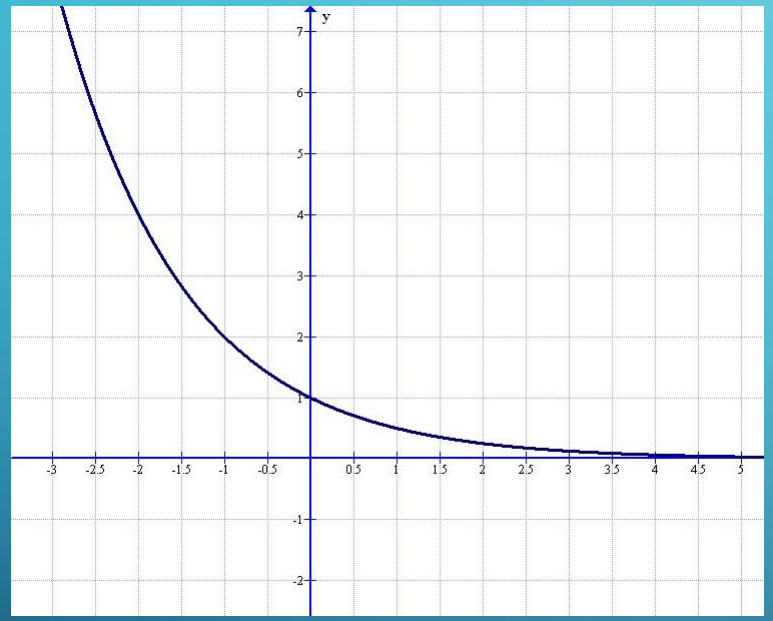
$$x = \left(\frac{1}{2}\right)^0 = 1$$

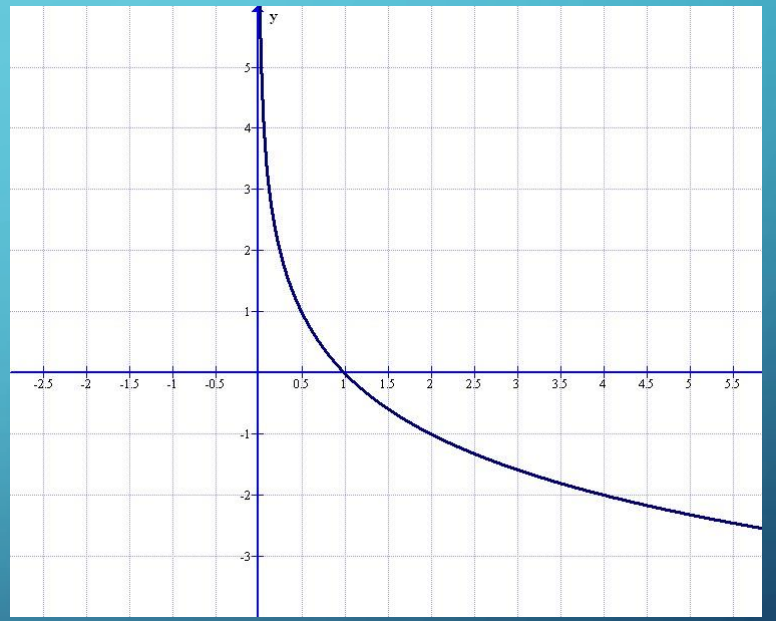
- Domain: $x > 0$
- Range: $y \in R$



Decreasing Exponential
Graph: $y = \frac{1}{2}^{x}$

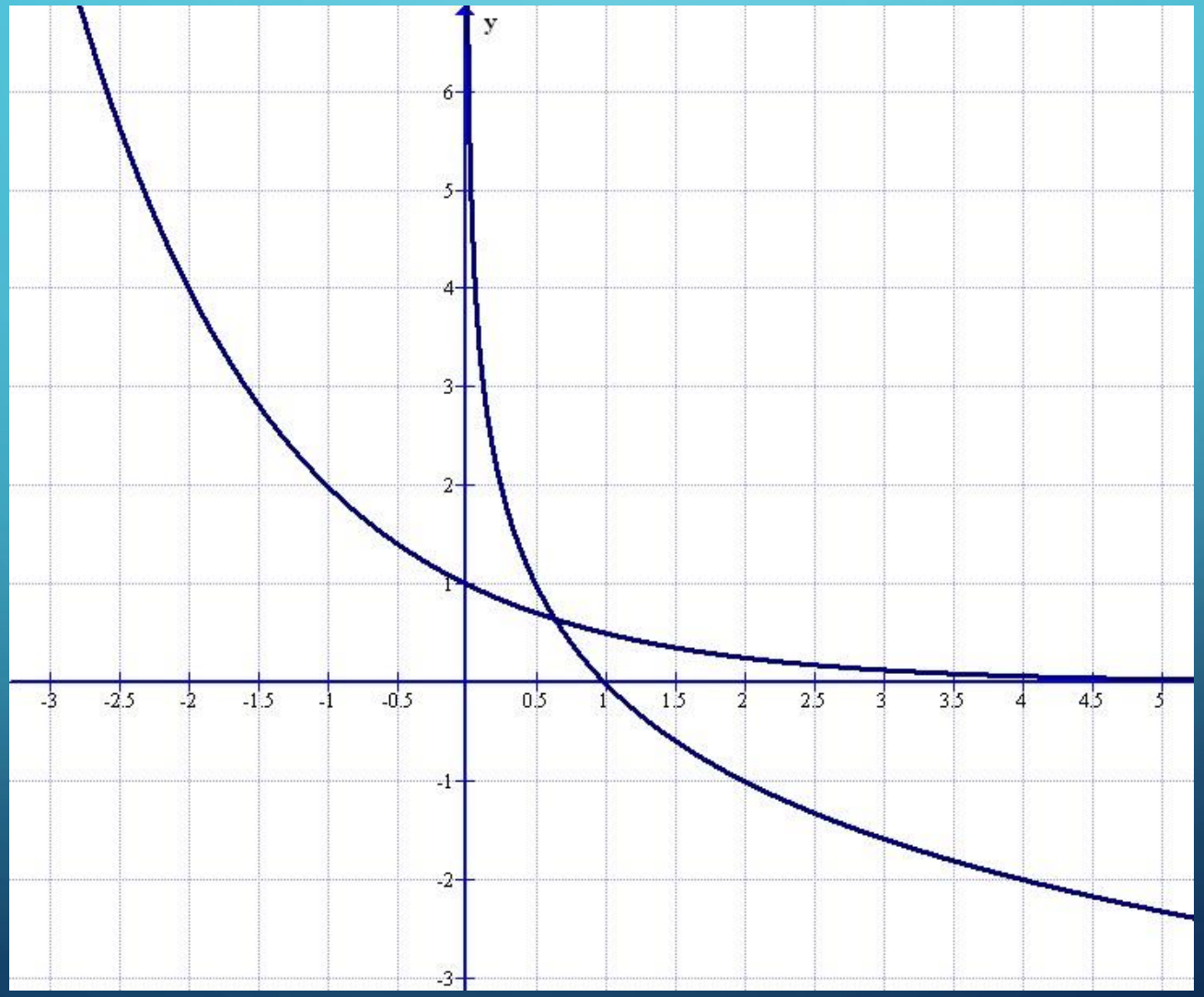
Decreasing Log
Graph: $y = \log_{\frac{1}{2}} x$




Together ….

# DECREASING EXPONENTIAL AND LOG GRAPHS ….



# EXERCISE 1

- Sketch the function and inverse of the following:
- A. f(x)= $3^x$
- B. g(x) = $\frac{1}{3}^x$

# EXERCISE 1 ANSWERS