

# **Graphing Exponential and Logarithmic Functions Video Lecture**

**Sections 12.3 and 12.4**

**Course Learning Objective:**

**Graph exponential and logarithmic equations.**

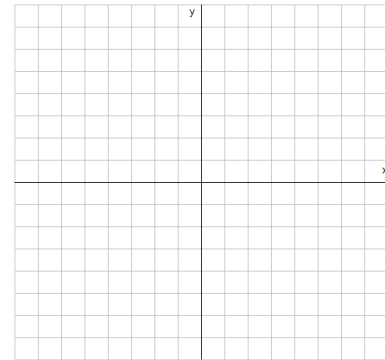
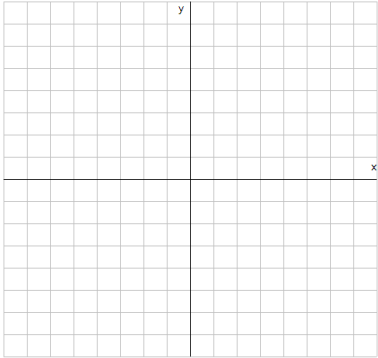
**Weekly Learning Objectives:**

- 1) Identify and graph exponential functions.**
- 2) Identify and graph logarithmic functions.**

# Graphing Exponential and Logarithmic Functions

Graph  $f(x) = 2^x$

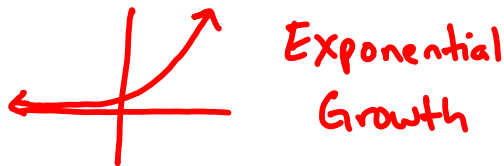
Graph  $f(x) = \left(\frac{1}{2}\right)^x$



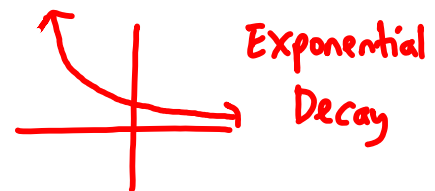
In general,

1) The graph of  $f(x) = b^x$  will always contain the point  $(0,1)$ .

2)  $b > 1$  gives



$0 < b < 1$  gives

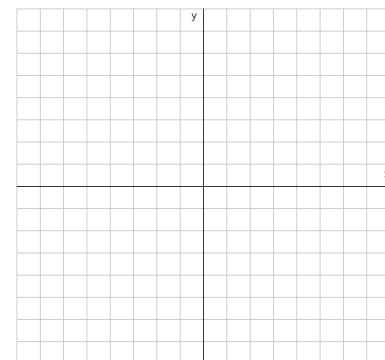


3) The graph has a horizontal asymptote  $y = 0$ .

4) The domain is  $(-\infty, \infty)$  and the range is  $(0, \infty)$

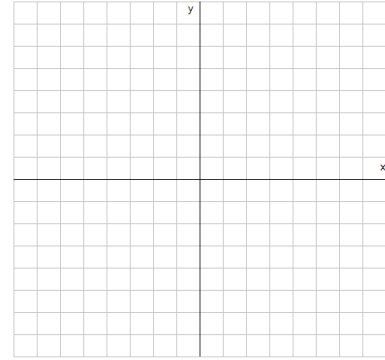
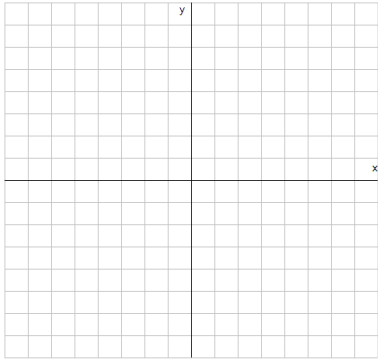
5) The function is one-to-one.

$$f(x) = 2^x + 1$$

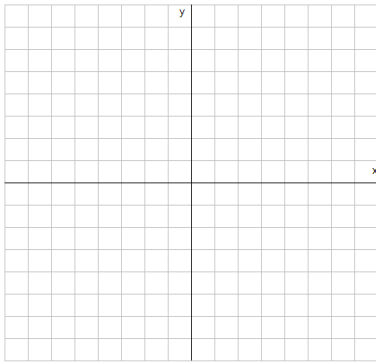


$$f(x) = 3^{-x}$$

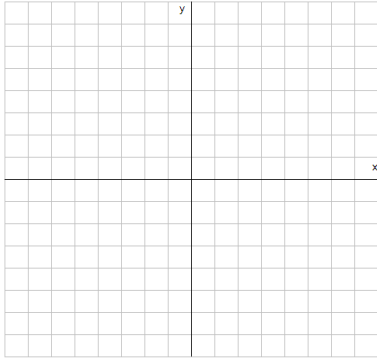
$$f(x) = -\left(\frac{1}{2}\right)^x - 2$$



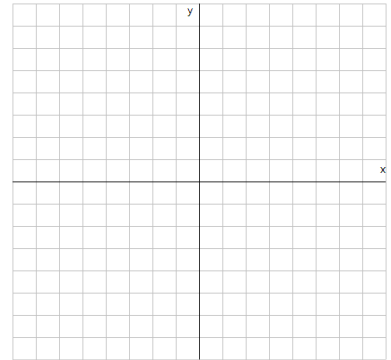
$$f(x) = 3^{x-1}$$



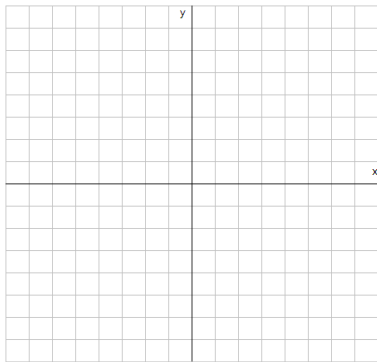
$$f(x) = e^x$$



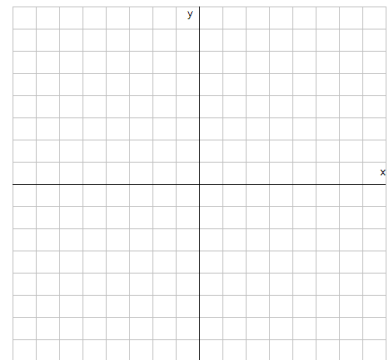
$$f(x) = e^x + 2$$



$$f(x) = 3e^x$$

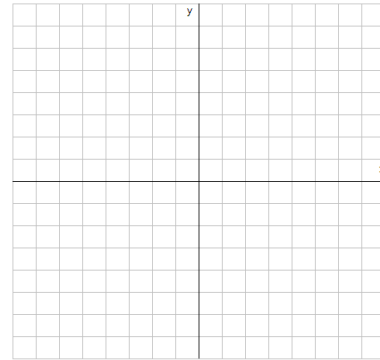
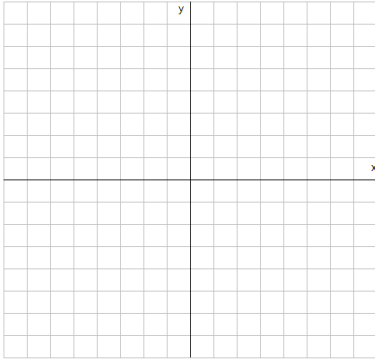


$$f(x) = e^{x+1}$$



Graph  $f(x) = \log_2 x$

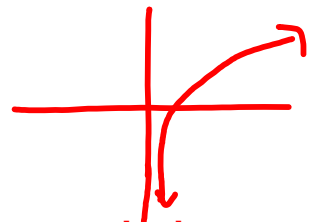
Graph  $f(x) = \log_{\frac{1}{2}} x$



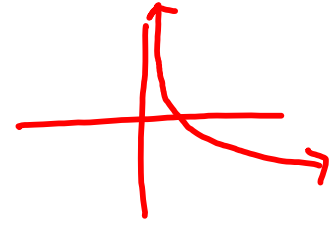
In general, if  $f(x) = \log_b x$

1) The graph will contain the point (1,0).

2)  $b > 1$  gives



$0 < b < 1$  gives



3) The graph has a vertical asymptote  $x = 0$ .

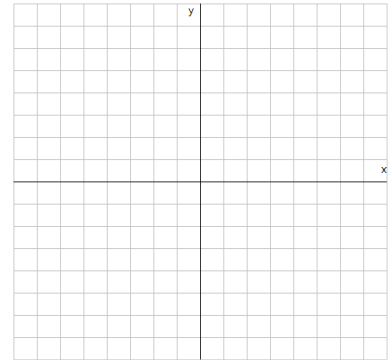
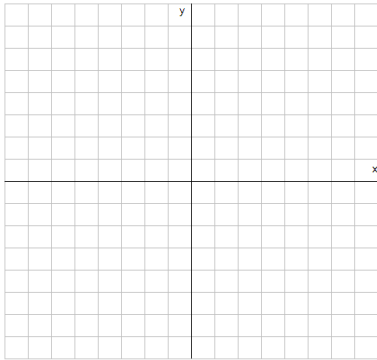
4) The domain is  $(0, \infty)$  and the range is  $(-\infty, \infty)$

To make a graph it is sufficient to plot the points:

$x$	$y = \log_b x$
$\frac{1}{b}$	$-1$
$b$	$1$

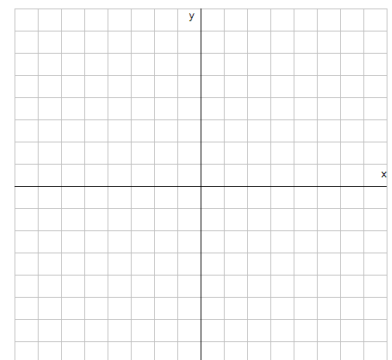
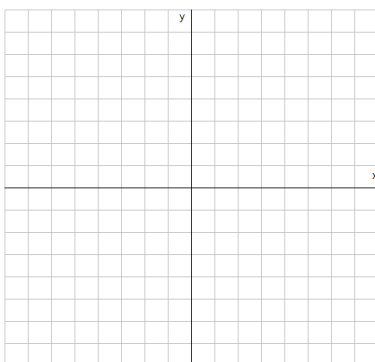
$$f(x) = \log_6 x$$

$$f(x) = 2 \log_{\frac{1}{5}} x$$



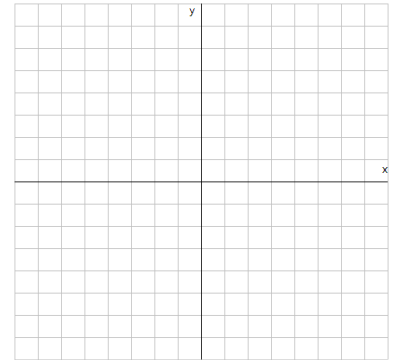
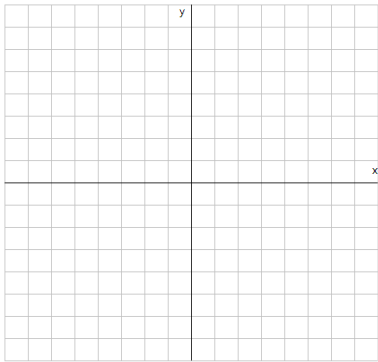
$$f(x) = \log_3 x - 2$$

$$f(x) = \ln x$$



$$f(x) = \ln x - 3$$

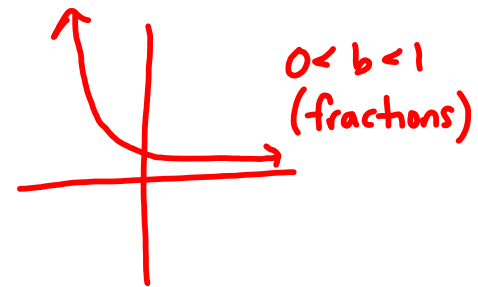
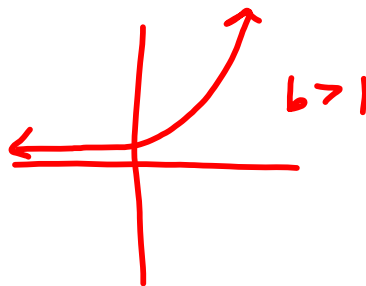
$$f(x) = -\ln x$$



Summary of graphing:

Exponential Functions:

$x$	$y = b^x$
-1	
0	
1	



Logarithmic Functions:

$x$	$y = \log_b x$
1	
$b$	
$\frac{1}{b}$	
$b$	

