

An exponential function is a function with the form

$$f(x) = a^x$$

where $a > 0$ and $a \neq 1$.

if $a > 1$, $f(x)$ is considered to be an exponential growth function

if $0 < a < 1$, $f(x)$ is considered to be an exponential decay function

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

$$f(x) = 0.3^x$$

$$f(x) = \left(\frac{1}{4}\right)^x$$

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

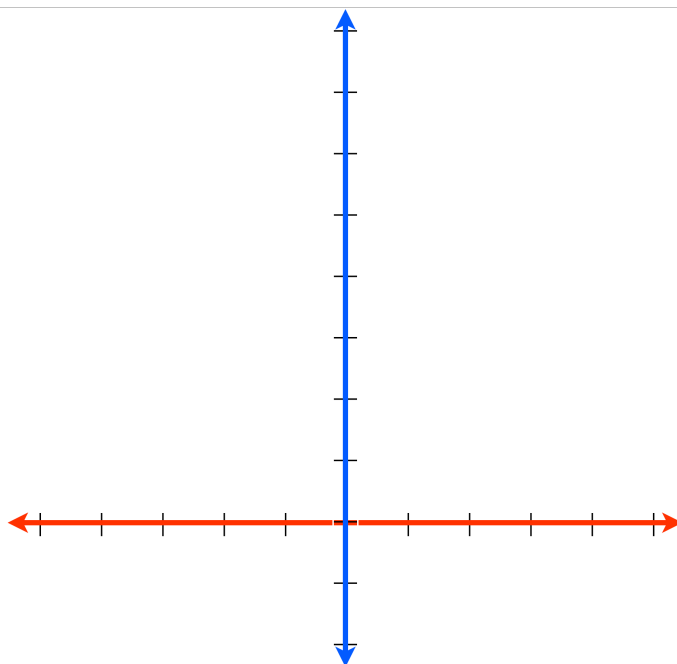
$$a > 1$$

x	$f(x)$
-3	$\frac{1}{8}$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8

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

$$0 < a < 1$$

x	$f(x)$
-3	8
-2	4
-1	2
0	1
1	$\frac{1}{2}$
2	$\frac{1}{4}$
3	$\frac{1}{8}$



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

$$a > 1$$

x	$f(x)$
-3	$\frac{1}{8}$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8

Exponential Functions when $a > 1$

Domain: $\{x \mid -\infty < x < \infty\}$

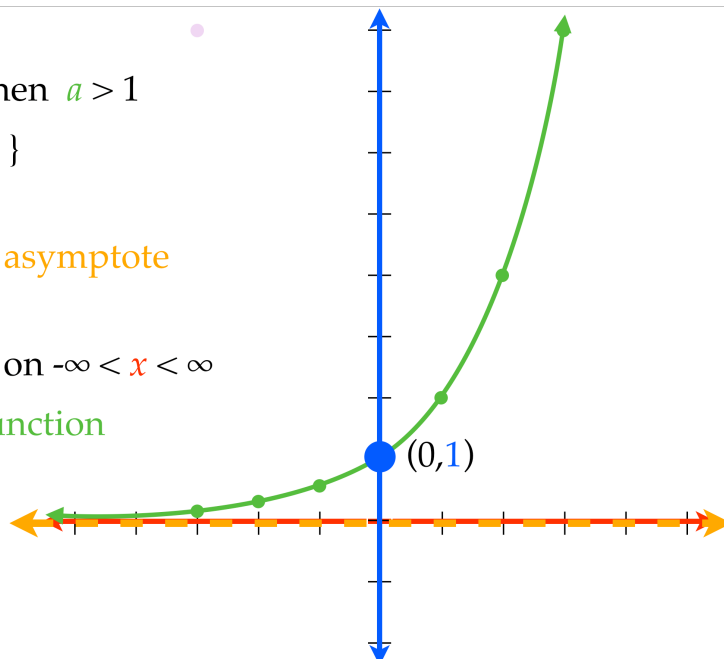
Range: $\{y \mid y > 0\}$

Line $y = 0$ is horizontal asymptote

y -intercept: $(0,1)$

An increasing function on $-\infty < x < \infty$

Exponential Growth Function



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

$$0 < a < 1$$

x	$f(x)$
-3	8
-2	4
-1	2
0	1
1	$\frac{1}{2}$
2	$\frac{1}{4}$
3	$\frac{1}{8}$

Exponential Functions when $0 < a < 1$

Domain: $\{x \mid -\infty < x < \infty\}$

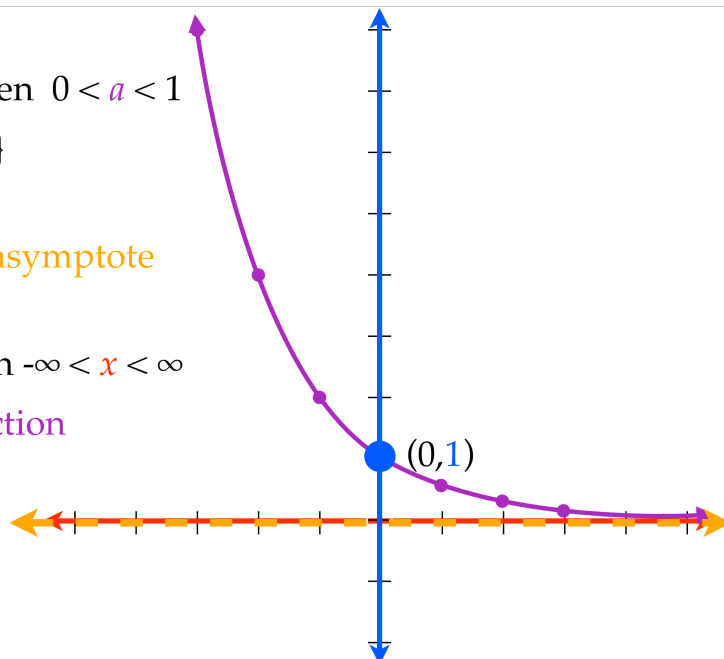
Range: $\{y \mid y > 0\}$

Line $y = 0$ is horizontal asymptote

y -intercept: $(0,1)$

A decreasing function on $-\infty < x < \infty$

Exponential Decay Function



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

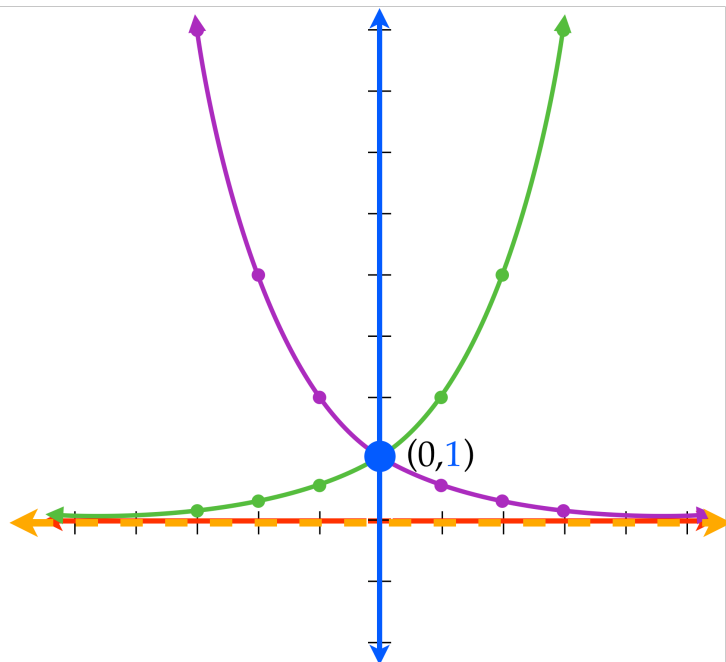
$a > 1$

x	$f(x)$
-3	$\frac{1}{8}$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8

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

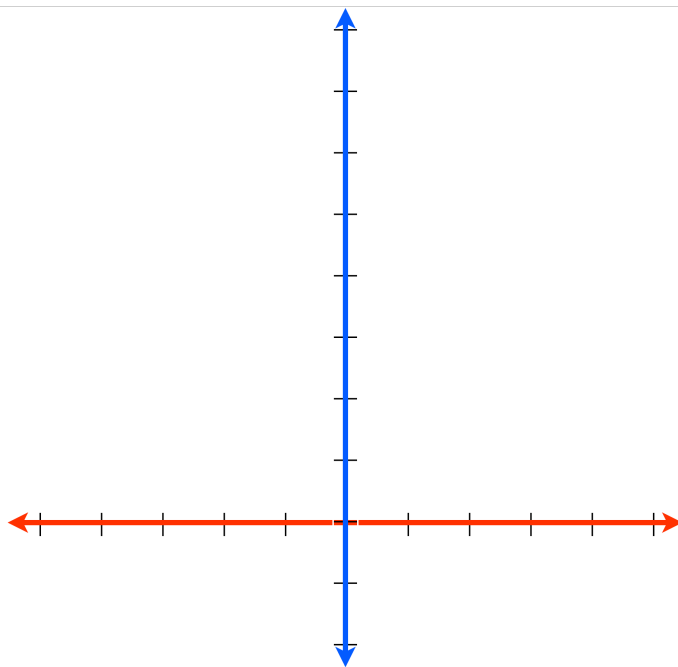
$0 < a < 1$

x	$f(x)$
-3	8
-2	4
-1	2
0	1
1	$\frac{1}{2}$
2	$\frac{1}{4}$
3	$\frac{1}{8}$



Graph the following using transformations

$$f(x) = 2^{(x+2)} - 1$$



Graph the following using transformations

$$f(x) = \left(\frac{1}{3}\right)^{(x-1)} + 2$$

