

Exponential Function: comes from a geometric sequence.

$$y = \underbrace{a}_{\substack{\downarrow \\ \text{initial} \\ \text{value}}} \cdot \underbrace{b^x}_{\substack{\downarrow \\ \text{common} \\ \text{ratio}}}$$

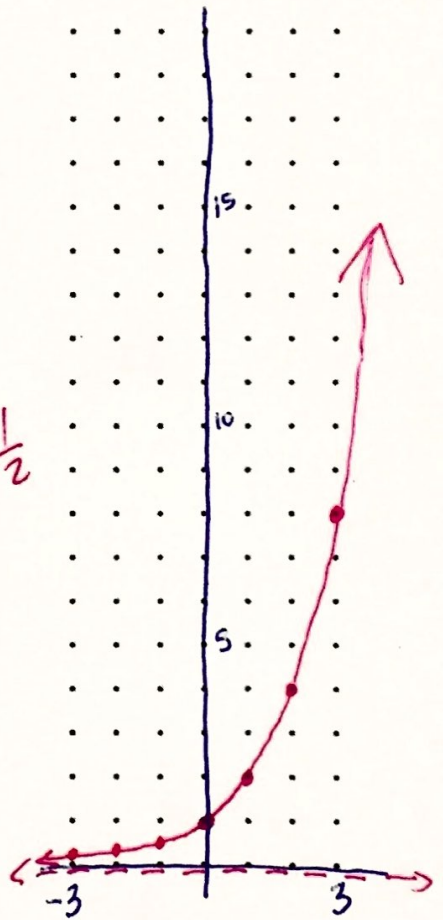
$b > 0$

y-int

Example 1: Graph the function $y = 2^x$

x	$1 \cdot 2^x$	y
-3	$2^{-3} = \frac{1}{2^3}$	$\frac{1}{8}$
-2	$2^{-2} = \frac{1}{2^2}$	$\frac{1}{4}$
-1	$2^{-1} = \frac{1}{2}$	$\frac{1}{2}$
0	$2^0 = 1$	1
1	$2^1 = 2$	2
2	$2^2 = 4$	4
3	$2^3 = 8$	8

$\uparrow \cdot \frac{1}{2}$
 $\uparrow \cdot \frac{1}{2}$
 $\uparrow \cdot \frac{1}{2}$
 $\uparrow \cdot 2$
 $\uparrow \cdot 2$
 $\uparrow \cdot 2$



Asymptote:

is a boundary

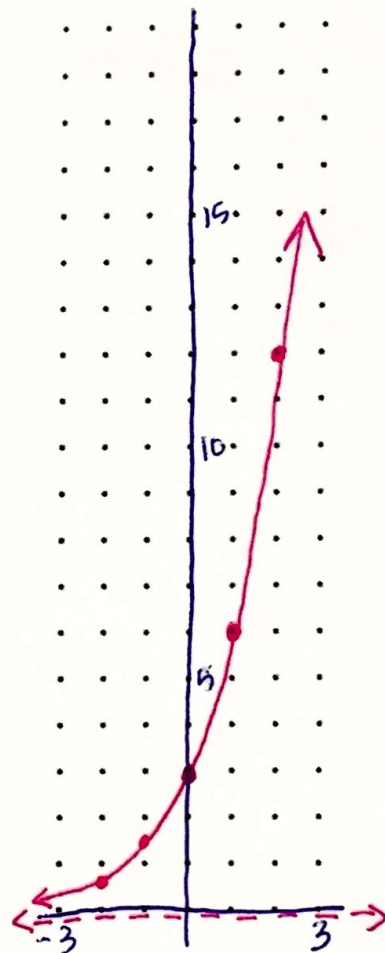
the graph approaches the line but does not hit or cross it.

↑
The dotted line is the asymptote.

Ex. 2: Graph the function $y = 3(2)^x$

x	$3(2)^x$	y
-2		$\frac{3}{4}$
-1	$3(2)^{-1} = 3 \cdot \frac{1}{2}$	$\frac{3}{2}$
0	$3(2)^0 = 3 \cdot 1$	3
1	$3(2)^1 = 3 \cdot 2$	6
2	$3(2)^2 = 3 \cdot 4$	12

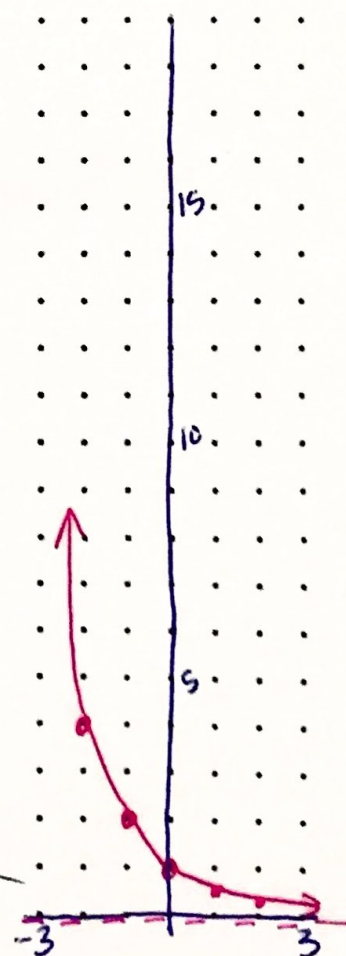
Handwritten notes in red ink: $\cdot \frac{1}{2}$ (upward arrows) and $\cdot 2$ (downward arrows) are written between rows to indicate the relationship between consecutive y-values.



Ex. 3: Graph the function $y = \left(\frac{1}{2}\right)^x$

x	$\left(\frac{1}{2}\right)^x$	y
-2		4
-1		2
0	$\left(\frac{1}{2}\right)^0$	1
1		$\frac{1}{2}$
2		$\frac{1}{4}$

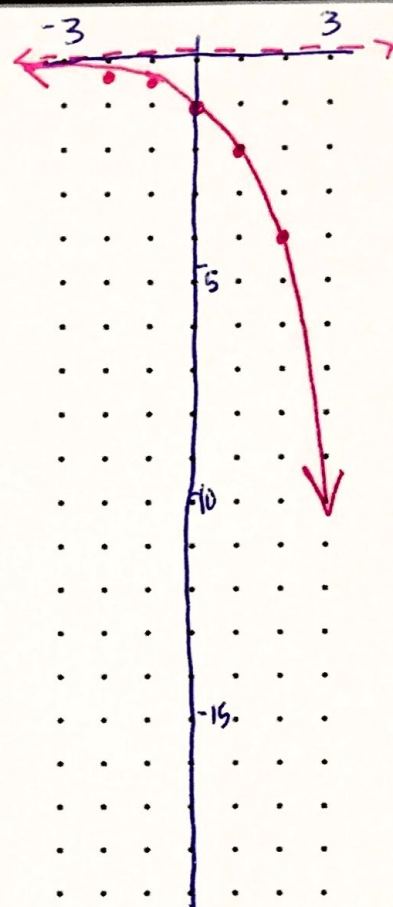
Handwritten notes in red ink: $\cdot 2$ (upward arrows) and $\cdot \frac{1}{2}$ (downward arrows) are written between rows to indicate the relationship between consecutive y-values.



Ex. 4: Graph the function $y = -2^x$ $y = -1 \cdot 2^x$

x		y
-2		-1/4
-1		-1/2
0	$-1 \cdot 2^0 = -1 \cdot 1$	-1
1		-2
2		-4

Handwritten notes: Blue arrows indicate a constant multiplier of $\frac{1}{2}$ for $x < 0$ and a constant multiplier of $\cdot 2$ for $x > 0$.



Ex. 5: What would the graph of $y = (-2)^x$ look like?

x	$(-2)^x$	y
-2	$(-2)^{-2} = \frac{1}{(-2)^2}$	1/4
-1	$(-2)^{-1} = \frac{1}{-2}$	-1/2
0	$(-2)^0$	1
1	$(-2)^1$	-2
2	$(-2)^2$	4

Not Exponential

