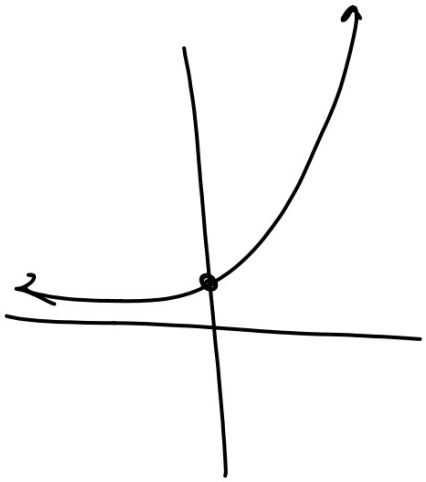
Algebra 1 7.5
Graph exponential functions
Identify exponential behavior

$y = \left(\frac{2}{3}\right)^x$

base
exponent
y-intercept
rate of change
linear
exponential growth
exponential decay

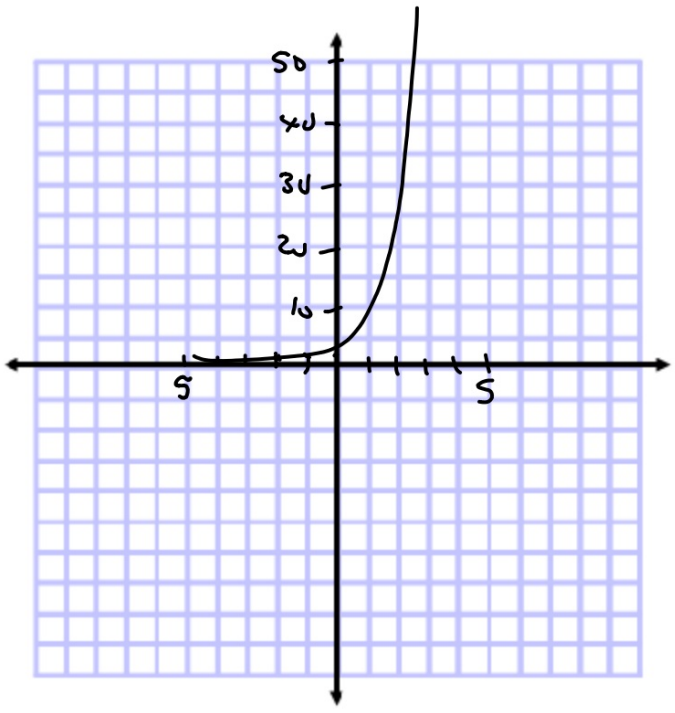


Activity: giant graphs

Guided Practice Base >1 $(0,1)$ Diarn $\mathbb{R}$ $y>0$

1. Graph $y = 7^x$. Find the y-intercept, and state the domain and range.

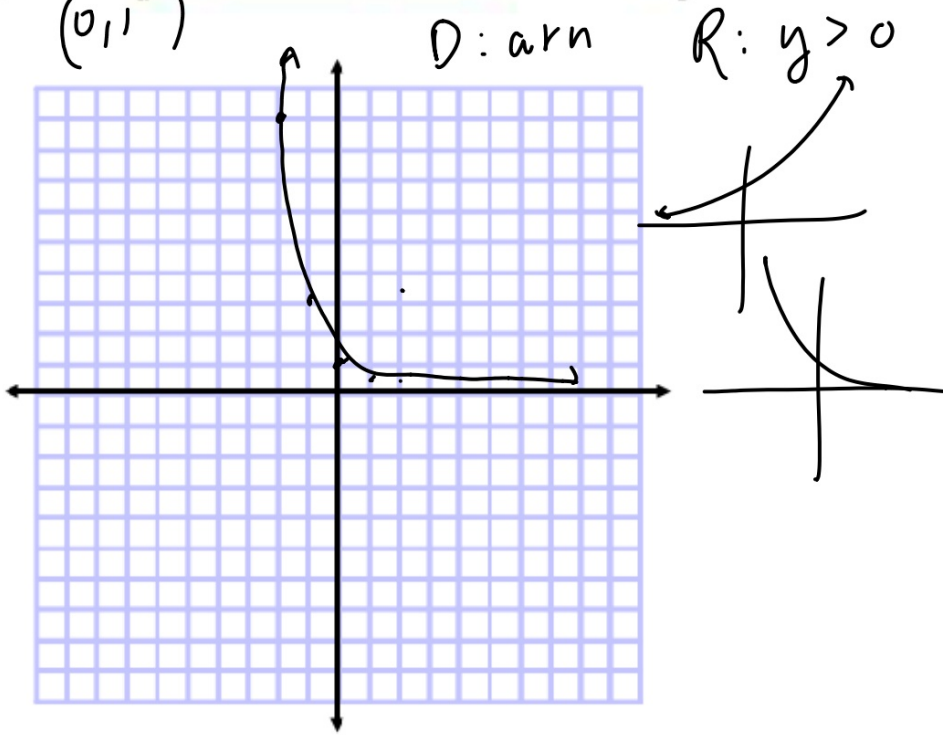
-2	$7^{-2} = \frac{1}{49}$	0.02
-1	$7^{-1} = \frac{1}{7}$	0.14
0	$7^0 =$	1
1	7^1	7
2	7^2	49



Example 2 Graph with $a > 0$ and $0 < b < 1$

Graph $y = \left(\frac{1}{3}\right)^x$. Find the y-intercept, and state the domain and range.

x		
-2	$\left(\frac{1}{3}\right)^{-2}$	9
-1	$\left(\frac{1}{3}\right)^{-1}$	3
0	$\left(\frac{1}{3}\right)^{0}$	1
1	$\left(\frac{1}{3}\right)^{1}$	$\frac{1}{3}$
2	$\left(\frac{1}{3}\right)^{2}$	$\frac{1}{9}$



KeyConcept Graphs of Exponential Functions

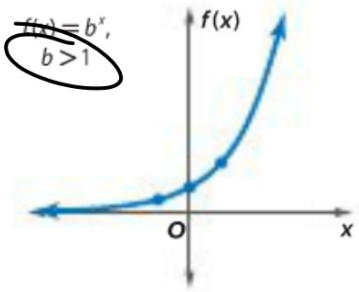
Exponential Growth Functions

Equation: $f(x) = ab^x$, $a > 0$, $b > 1$

Domain, Range: all reals; all positive reals

Intercepts: one y-intercept, no x-intercepts

End behavior: as x increases, $f(x)$ increases; as x decreases, $f(x)$ approaches 0



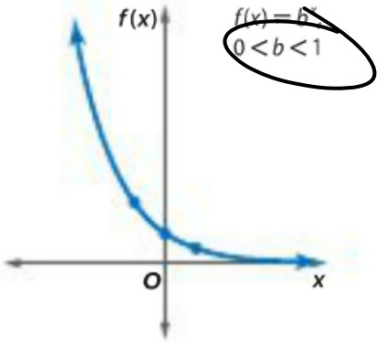
Exponential Decay Functions

Equation: $f(x) = ab^x$, $a > 0$, $0 < b < 1$

Domain, Range: all reals; all positive reals

Intercepts: one y-intercept, no x-intercepts

End behavior: as x increases, $f(x)$ approaches 0; as x decreases, $f(x)$ increases



yes:

Is it a multiplying rule?

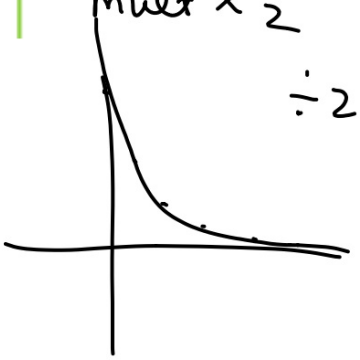
Example 4 Identify Exponential Behavior

Determine whether the set of data shown below displays exponential behavior. Write *yes* or *no*. Explain why or why not.

yes

must $\times \frac{1}{2}$

$\div 2$



x	0	5	10	15	20	25
y	64	32	16	8	4	2

$\times \frac{1}{2}$

Is it a multiplying rule?

4. Determine whether the set of data shown below displays exponential behavior. Write *yes* or *no*. Explain why or why not.

x	0	3	6	9	12	15
y	12	16	20	24	28	32

no
adding +4

Gema

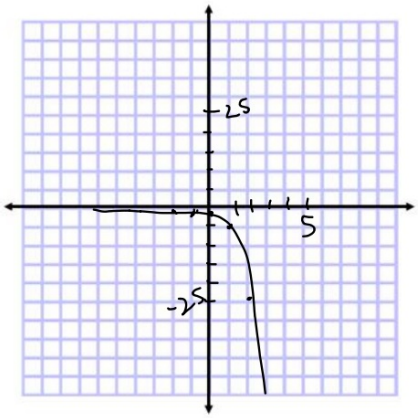
$y = -5^x$

$y = -1 \cdot 5^x$

D: arn

R: $y < 0$

-2	$-1 \cdot 5^{-2}$	$-1 \cdot \frac{1}{5} \cdot \frac{1}{5} = \frac{-1}{25}$
-1	$-1 \cdot 5^{-1}$	$-1 \cdot \frac{1}{5} = \frac{-1}{5}$
0	$-1 \cdot 5^0$	$-1 \cdot 1 = -1$
1	$-1 \cdot 5^1$	$-1 \cdot 5 = -5$
2	$-1 \cdot 5^2$	$-1 \cdot 25 = -25$



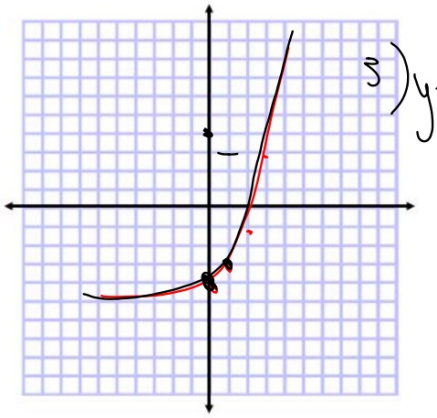
D: arn

$y > 3$

$y = 2^x + 3$

$y = 2^x - 5$

-1		
0	$2^0 - 5$	-4
1	$2^1 - 5$	-3
2		



1) $y = 3^x + 1$

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