Algebra 1 7.5

Graph exponential functions

~~Identify~~ exponential behavior

base

exponent

y-intercept

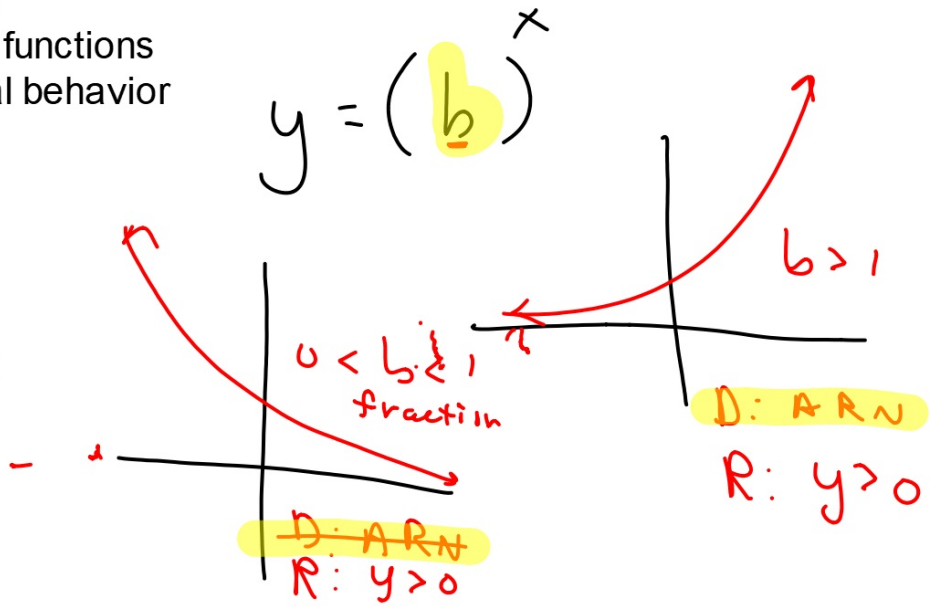
rate of change

linear

exponential growth

exponential decay

whiteboards

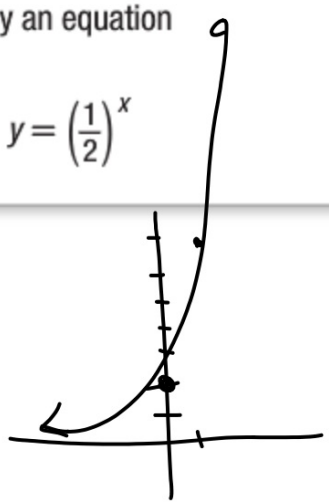


KeyConcept Exponential Function

Words An exponential function is a function that can be described by an equation of the form $y = ab^x$, where $a \neq 0$, $b > 0$, and $b \neq 1$.

Examples $y = 2(3)^x$ $y = 4^x$ $y = \left(\frac{1}{2}\right)^x$

x	$2(3)^x$	y
0	$2 \cdot 1$	2
1	$2 \cdot 3$	6



KeyConcept Graphs of Exponential Functions

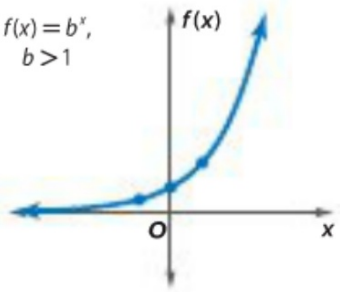
Exponential Growth Functions

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



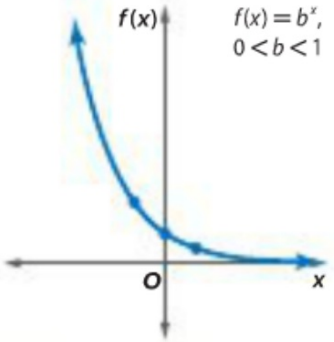
Exponential Decay Functions

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



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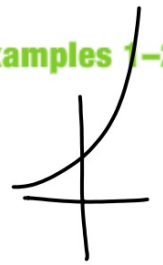
Examples 1–2 Graph each function. Find the ~~y-intercept~~ and state the domain and range.

1. $y = 2^x$

2. $y = -5^x$

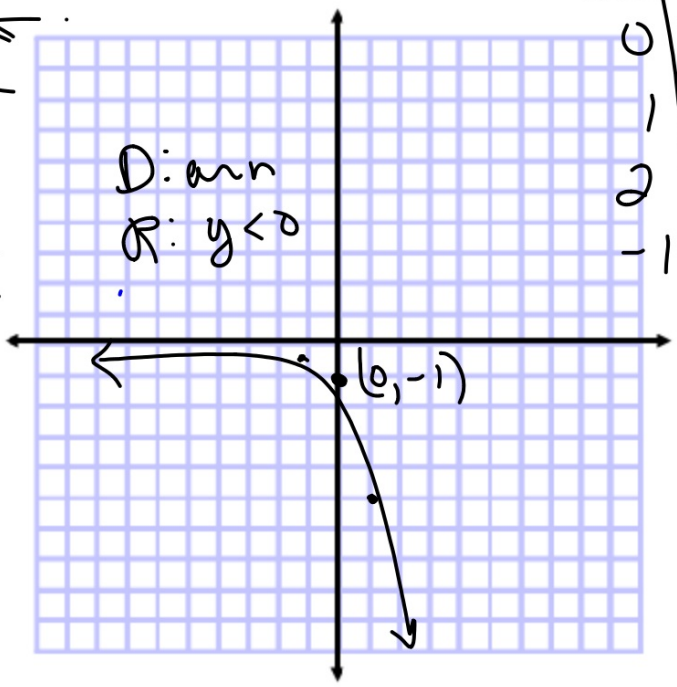
$-1 \cdot 5^x$

3. $y = -\left(\frac{1}{5}\right)^x$



x	
0	1
1	2
2	4
−1	$\frac{1}{2}$

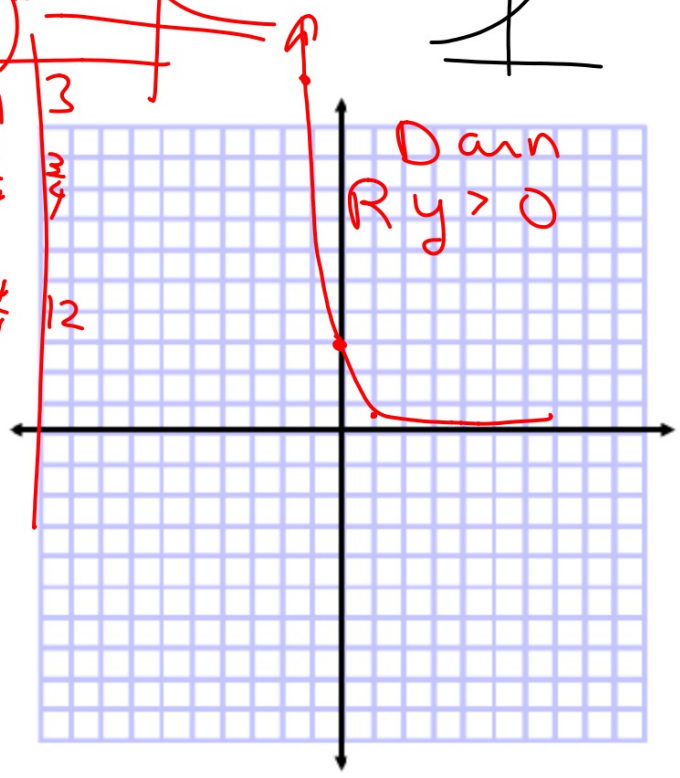
x	$-1 \cdot 5^x$
0	−1
1	−1
2	−1
−1	−1



1. What shape is it?
2. Find ordered pairs (table) T.O.V.
3. Follow order of operations in equation

4. $y = 3\left(\frac{1}{4}\right)^x$

x	$3\left(\frac{1}{4}\right)^x$	
0	$3 \cdot 1$	3
1	$3 \cdot \frac{1}{4}$	$\frac{3}{4}$
-1	$3 \cdot \frac{4}{1}$	12



5. $f(x) = 6^x + 3$

x	$6^x + 3$	
0	$6^0 + 3$	4
1	$6^1 + 3$	9
-1	$6^{-1} + 3$	$3\frac{1}{6}$
4		

Is it a multiplication 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

+4 +4

no

Is it a multiplication rule?

9.

x	2	4	6	8	10	12
y	1	4	16	64	256	1024

yes

Is it a multiplication rule?

8.

x	1	2	3	4	5	6
y	−4	−2	0	2	4	6

+2 +2 +2 +2 +2

GuidedPractice

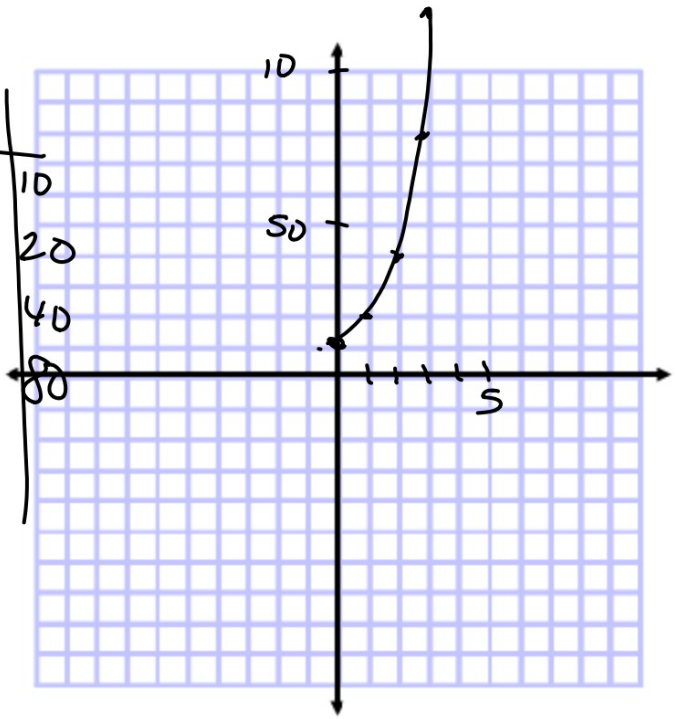
3. BIOLOGY A certain bacteria population doubles every 20 minutes. Beginning with 10 cells in a culture, the population can be represented by the function $B = 10(2)^t$, where B is the number of bacteria cells and t is the time in 20 minute increments. How many will there be after 2 hours?

$B = 10(2)^t$

$= 10(2)^6$

$= 640$

x	$10 \cdot 2^x$
0	10
1	20
2	40
3	80

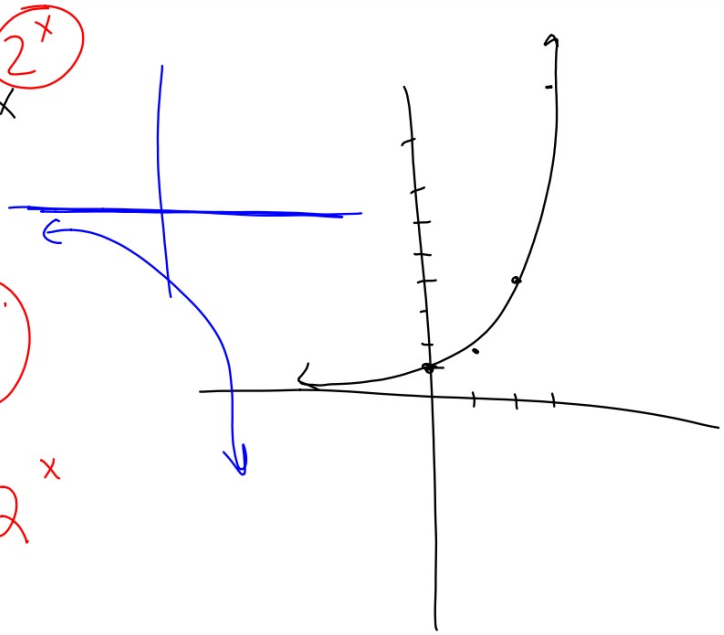


$y = -5 \cdot 2^x$

$y = 2^x$

$y = 3 \cdot 2^x$

$y = -3 + 2^x$



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