Algebra 1 7.5

Graph exponential functions

Identify behavior that displays exponential behavior

base $b > 1$

exponent

y-intercept

rate of change

linear

exponential growth

exponential decay

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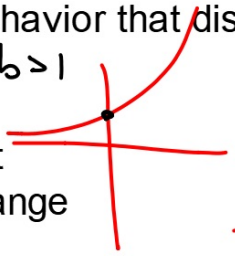
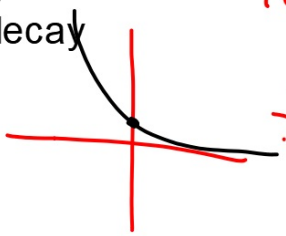
$0 < b < 1$

$\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}$



1	2	3	4	5
100	50	25	12.5	6.25

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



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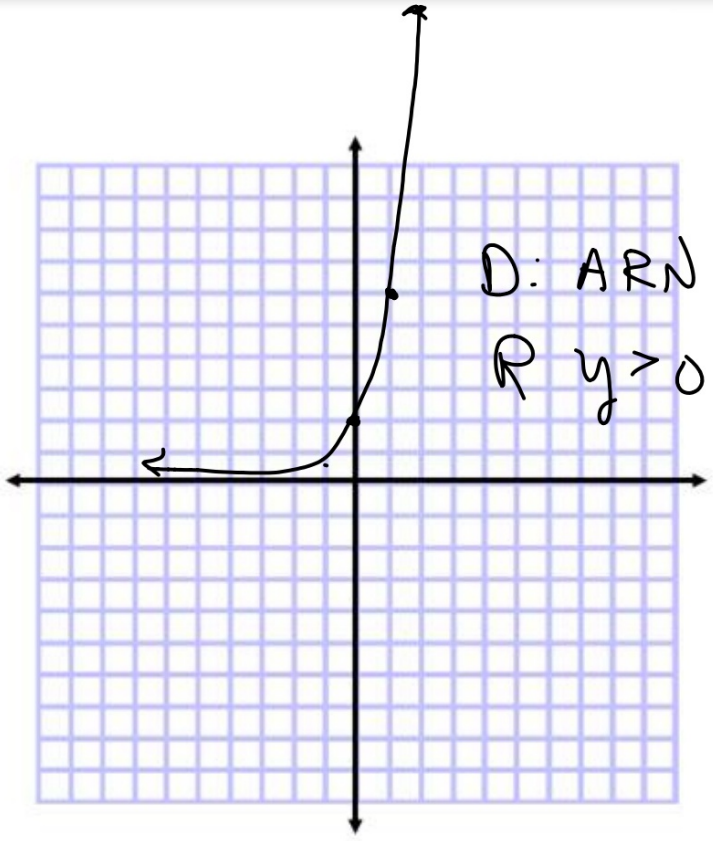
KeyConcept Exponential Function

Words	An exponential fun of the form $y = ab$
Examples	$y = 2(3)^x$

	$2(3)^x$	
-1	$2 \cdot 3^{-1}$	$\frac{2}{3}$
0	$2 \cdot 3^0$	2
1	$2 \cdot 3^1$	6
2	$2 \cdot 3^2$	18



KeyConcept Graphs of Exponential Functions

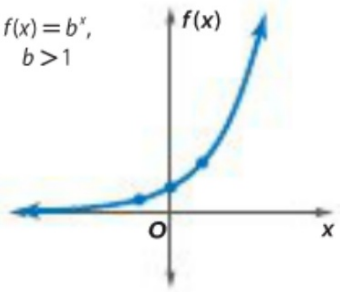
Exponential Growth Functions

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



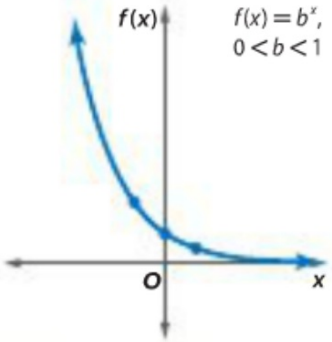
Exponential Decay Functions

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. $y = -5^x$

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

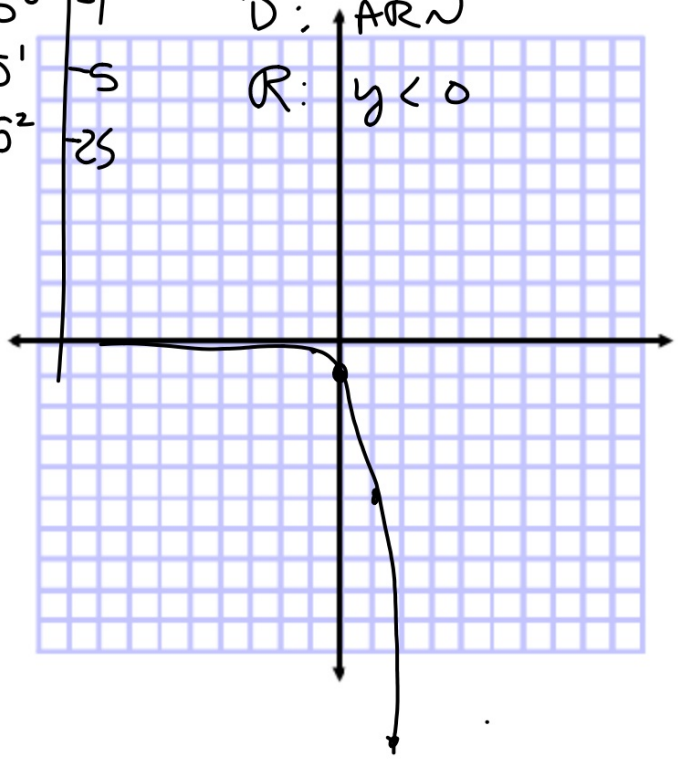
-5^x

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

y int $(0,-1)$

D: ARN

R: $y < 0$



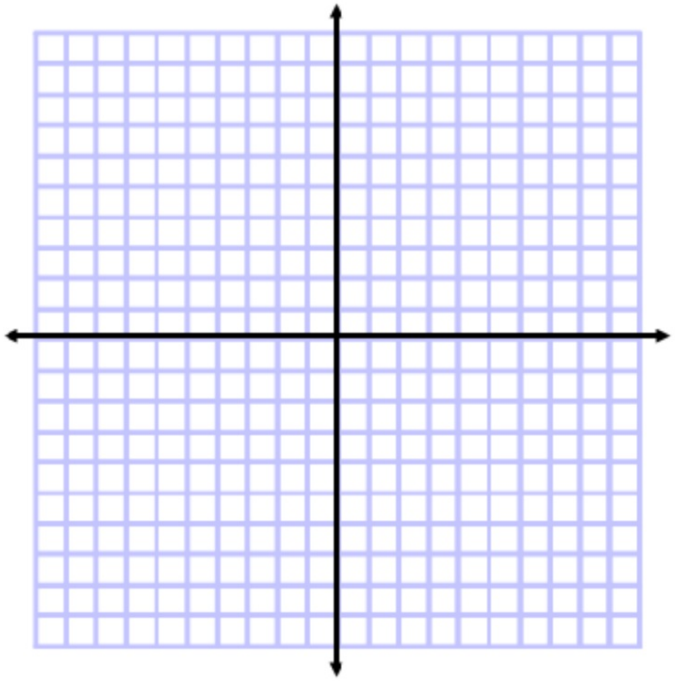
1. What shape is it?
2. Find ordered pairs (table)
3. Follow order of operations in equation

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

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

-1
0
1
2

-1
0
1
2
3



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

Is it a multiplication rule?

9.

x	2	4	6	8	10	12
y	1	4	16	64	~~256~~ 128	~~1024~~ 512

Is it a multiplication rule?

8.

x	1	2	3	4	5	6
y	−4	−2	0	2	4	6

GuidedPractice

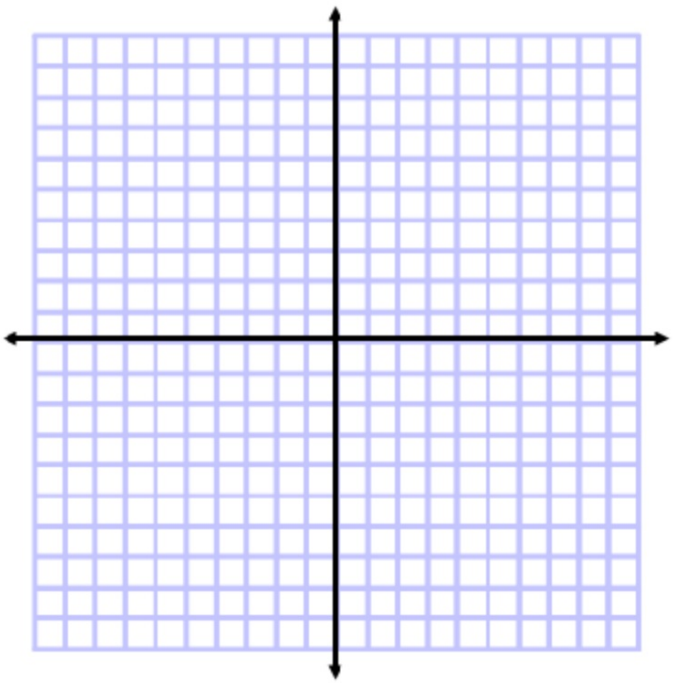
3. BIOLOGY A certain bacteria population doubles every 20 minutes. Beginning with 10 cells in a culture, the population can be represented by the function $B = 10(2)^t$, where B is the number of bacteria cells and t is the time in 20 minute increments. How many will there be after 2 hours?

$B = 10(2)^t$

$B = 10(2)^6$

$= 10 \cdot 64$

$= 640$



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