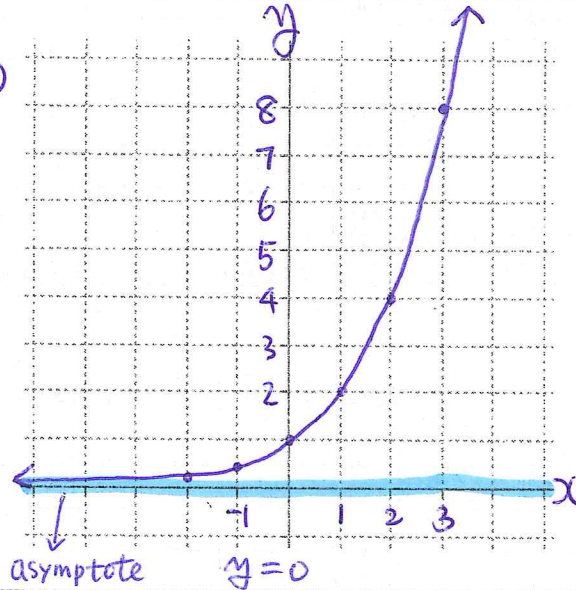


The Graphs of Exponential Functions

$y = ab^x$

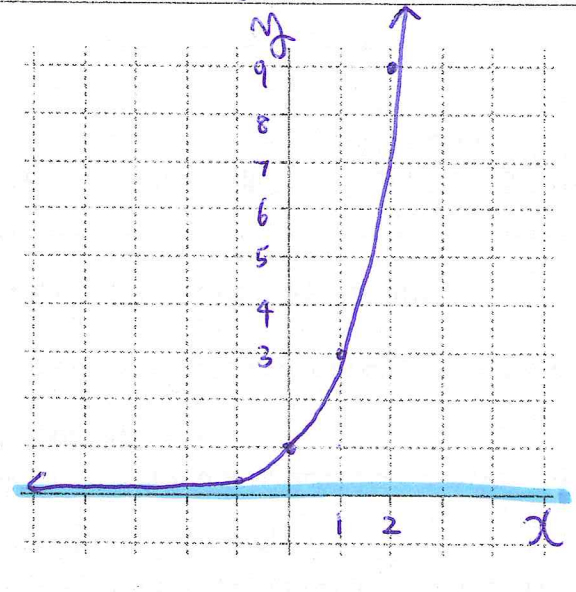
First Diff

$y = 2^x$
 y-intercept is 1 (when $x=0$)
 $a = 1$
 $b = 2$
 increasing, decreasing, neither (circle one)
 Domain = $\{x \in \mathbb{R}\}$
 Range = $\{y \in \mathbb{R}, y > 0\}$



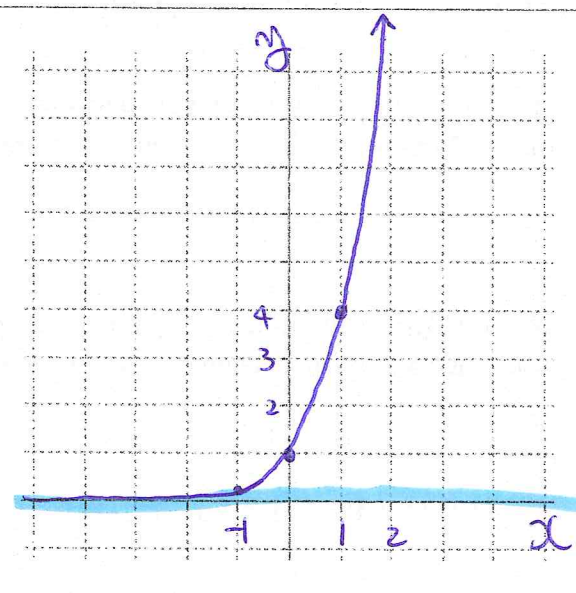
x	y	Δy $y_2 - y_1$	Ratio of $\frac{\Delta y}{y_1}$
-1	$\frac{1}{2}$		
0	1	$\frac{1}{2}$	1 $\rightarrow \frac{1}{\frac{1}{2}}$
1	2	1	1 $\rightarrow \frac{1}{1}$
2	4	2	1 $\rightarrow \frac{2}{2}$
3	8	4	1
4	16	8	1

$y = 3^x$
 y-intercept is 1
 $a = 1$
 $b = 3$
 increasing, decreasing, neither (circle one)
 Domain = $\{x \in \mathbb{R}\}$
 Range = $\{y \in \mathbb{R}, y > 0\}$



x	y	Δy	Ratio of $\frac{\Delta y}{y_1}$
-1	$\frac{1}{3}$		
0	1	$\frac{2}{3}$	2
1	3	2	2
2	9	6	2
3	27	18	2
4	81	54	2

$y = 4^x$
 y-intercept is 1
 $a = 1$
 $b = 4$
 increasing, decreasing, neither (circle one)
 Domain = $\{x \in \mathbb{R}\}$
 Range = $\{y \in \mathbb{R}, y > 0\}$



x	y	Δy	Ratio of $\frac{\Delta y}{y_1}$
-1	$\frac{1}{4}$		
0	1	$\frac{3}{4}$	3
1	4	3	3
2	16	12	3
3	64	48	3
4	256	192	3

$y = 1^x$

y-intercept is

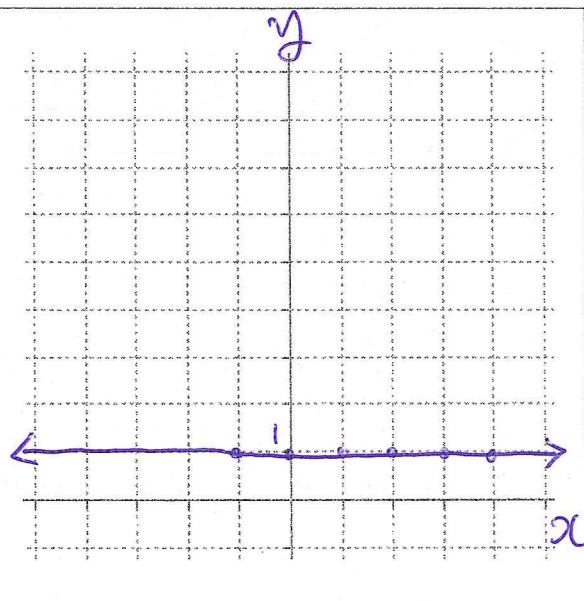
$a = 1$

$b = 1$

increasing, decreasing, **neither** (circle one)

Domain = $\{x \in \mathbb{R}\}$

Range = $\{y = 1\}$



x	y	Δy	Ratio of $\frac{\Delta y}{y}$
-1	1		
0	1	0	0
1	1	0	0
2	1	0	0
3	1	0	0
4	1	0	0

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

y-intercept is 1

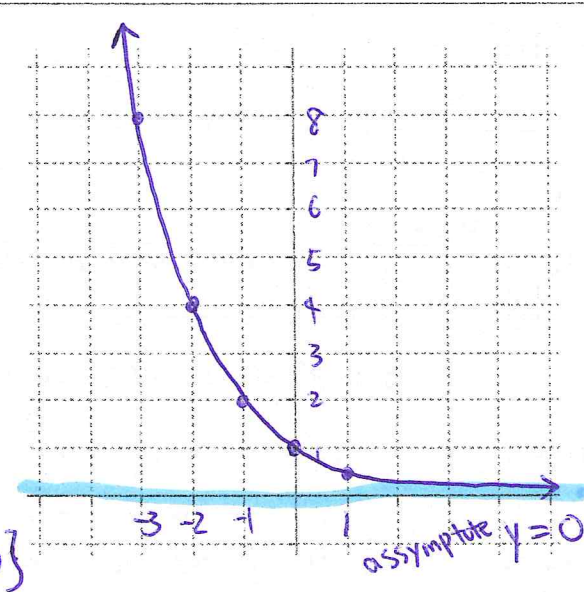
$a = 1$

$b = \frac{1}{2}$

increasing, **decreasing**, neither (circle one)

Domain = $\{x \in \mathbb{R}\}$

Range = $\{y \in \mathbb{R}, y > 0\}$



x	y	Δy	Ratio of $\frac{\Delta y}{y}$
-4	16		
-3	8	-8	$-\frac{1}{2}$
-2	4	-4	$-\frac{1}{2}$
-1	2	-2	$-\frac{1}{2}$
0	1	-1	$-\frac{1}{2}$
1	$\frac{1}{2}$	$-\frac{1}{2}$	$-\frac{1}{2}$

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

y-intercept is 1

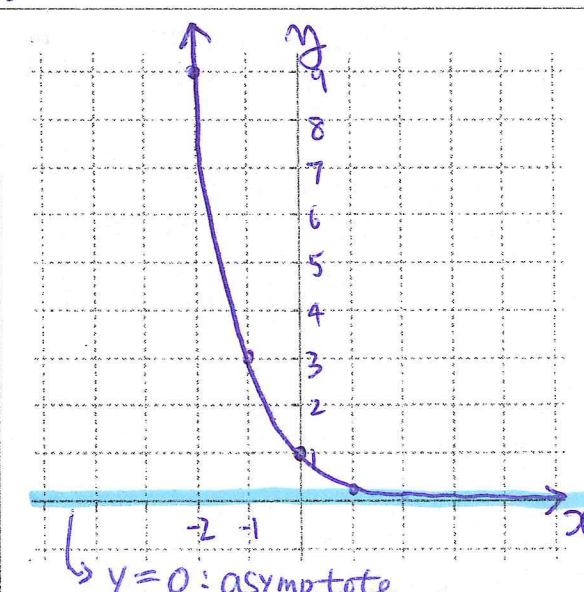
$a = 1$

$b = \frac{1}{3}$

increasing, **decreasing**, neither (circle one)

Domain = $\{x \in \mathbb{R}\}$

Range = $\{y \in \mathbb{R}, y > 0\}$



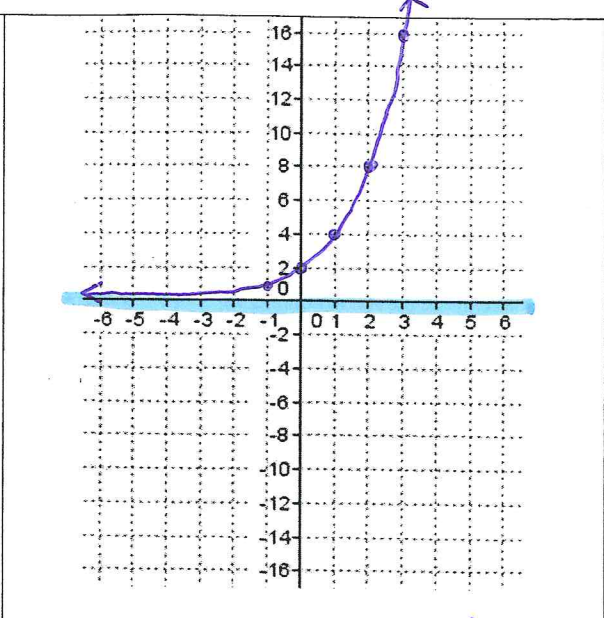
x	y	Δy	Ratio of $\frac{\Delta y}{y}$
-3	27		
-2	9	-18	$-\frac{2}{3}$
-1	3	-6	$-\frac{2}{3}$
0	1	-2	$-\frac{2}{3}$
1	$\frac{1}{3}$	$-\frac{2}{3}$	$-\frac{2}{3}$
2	$\frac{1}{9}$	$-\frac{2}{9}$	$-\frac{2}{3}$

$-\frac{18}{27}$

When $x = -1 \rightarrow y = \left(\frac{1}{3}\right)^{-1} = \frac{1}{\left(\frac{1}{3}\right)^1} = \frac{1}{\frac{1}{3}} = \frac{1 \times 3}{1} = 3$

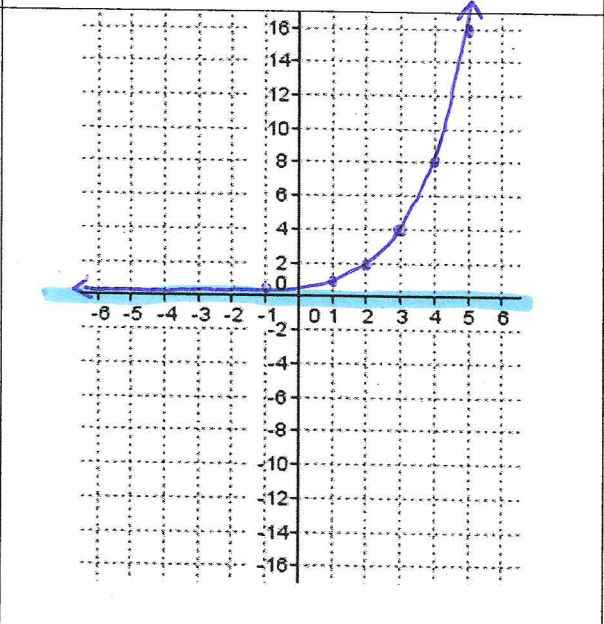
When $x = -2 \rightarrow y = \left(\frac{1}{3}\right)^{-2} = \frac{1}{\left(\frac{1}{3}\right)^2} = \frac{1}{\frac{1}{9}} = 9$

$y = 2(2^x)$
 y-intercept is 2
 $a = 2$
 $b = 2$
 increasing, decreasing, neither (circle one)
 Domain = $\{x \in \mathbb{R}\}$
 Range = $\{y \in \mathbb{R}, y > 0\}$



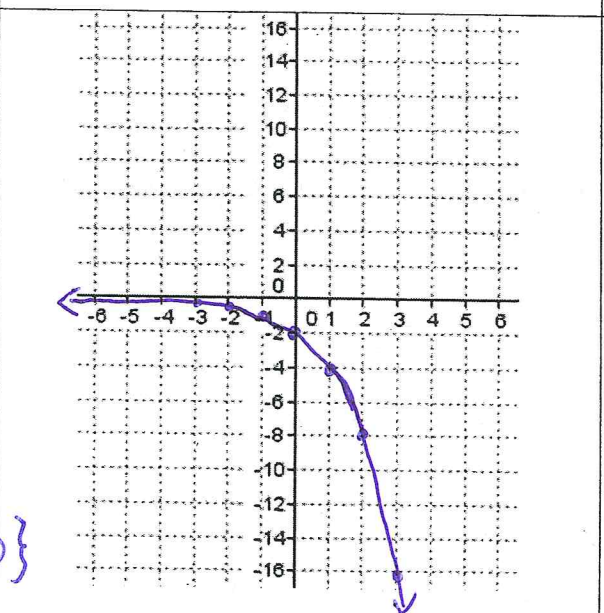
x	y	Δy	Ratio
-1	1		
0	2	1	1
1	4	2	1
2	8	4	1
3	16	8	1
4	32	16	1

$y = \frac{1}{2}(2^x)$
 y-intercept is
 $a = \frac{1}{2}$
 $b = 2$
 increasing, decreasing, neither (circle one)
 Domain = $\{x \in \mathbb{R}\}$
 Range = $\{y \in \mathbb{R}, y > 0\}$



x	y	Δy	Ratio
-4	$\frac{1}{32}$	$\frac{1}{32}$	1
-3	$\frac{1}{16}$	$\frac{1}{16}$	1
-2	$\frac{1}{8}$	$\frac{1}{8}$	1
-1	$\frac{1}{4}$	$\frac{1}{4}$	1
0	$\frac{1}{2}$	$\frac{1}{2}$	1
1	1		

$y = -2(2^x)$
 y-intercept is -2
 $a = -2$
 $b = 2$
 increasing, decreasing, neither (circle one)
 Domain = $\{x \in \mathbb{R}\}$
 Range = $\{y \in \mathbb{R}, y < 0\}$



x	y	Δy	Ratio
-3	$-\frac{1}{4}$	$-\frac{1}{4}$	1
-2	$-\frac{1}{2}$	$-\frac{1}{2}$	1
-1	-1	-1	1
0	-2	-2	1
1	-4	-4	1
2	-8	-4	1

* youtube : "Graphing Exponential functions" by Patrick JMT

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