Unit 8 Day 4: Writing and Graphing Exponential Functions

Focus Question: Can I transfer between an equation, table, and graph of an exponential function?

A. Graphing Exponential functions

For each function, identify if it is growth or decay. Then, fill in the table of values and graph. Finally, answer the questions.

1. $f(x) = 3 \cdot 2^x$

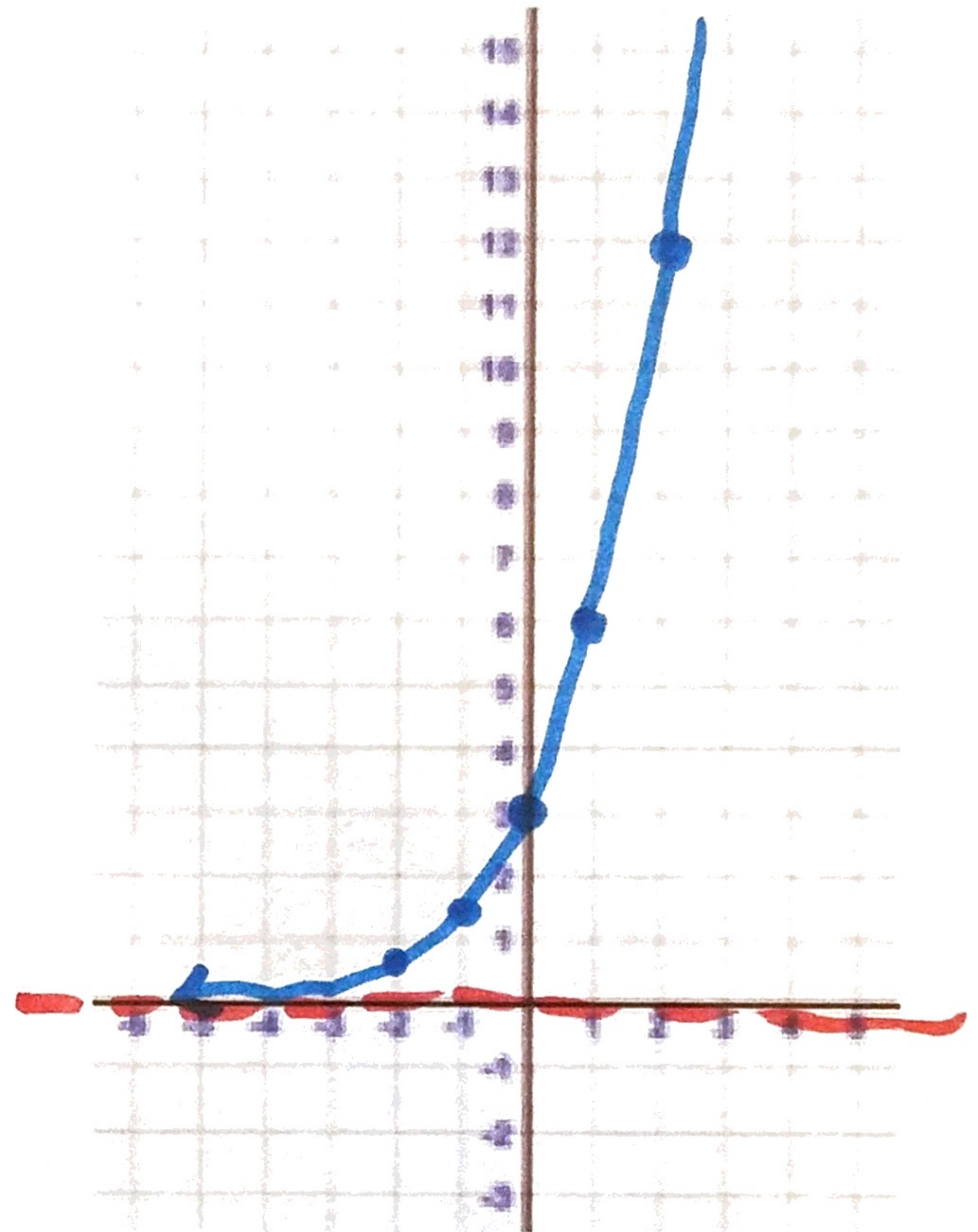| x	f(x)
-2	3/4
-1	3/2
0	3·2
1	6·2
2	12

$3 \cdot 2^{-1} = 3 \cdot \frac{1}{2}$
$3 \cdot 2^0 = 3 \cdot 1$
$3 \cdot 2^1 = 3 \cdot 2$

This is exponential **growth**

because **b = 2   {2 > 1**

What is the equation of the asymptote?

y = 0

What is the range? **(0, ∞)**

2. $g(x) = 6 \cdot \left(\dfrac{1}{3}\right)^x$

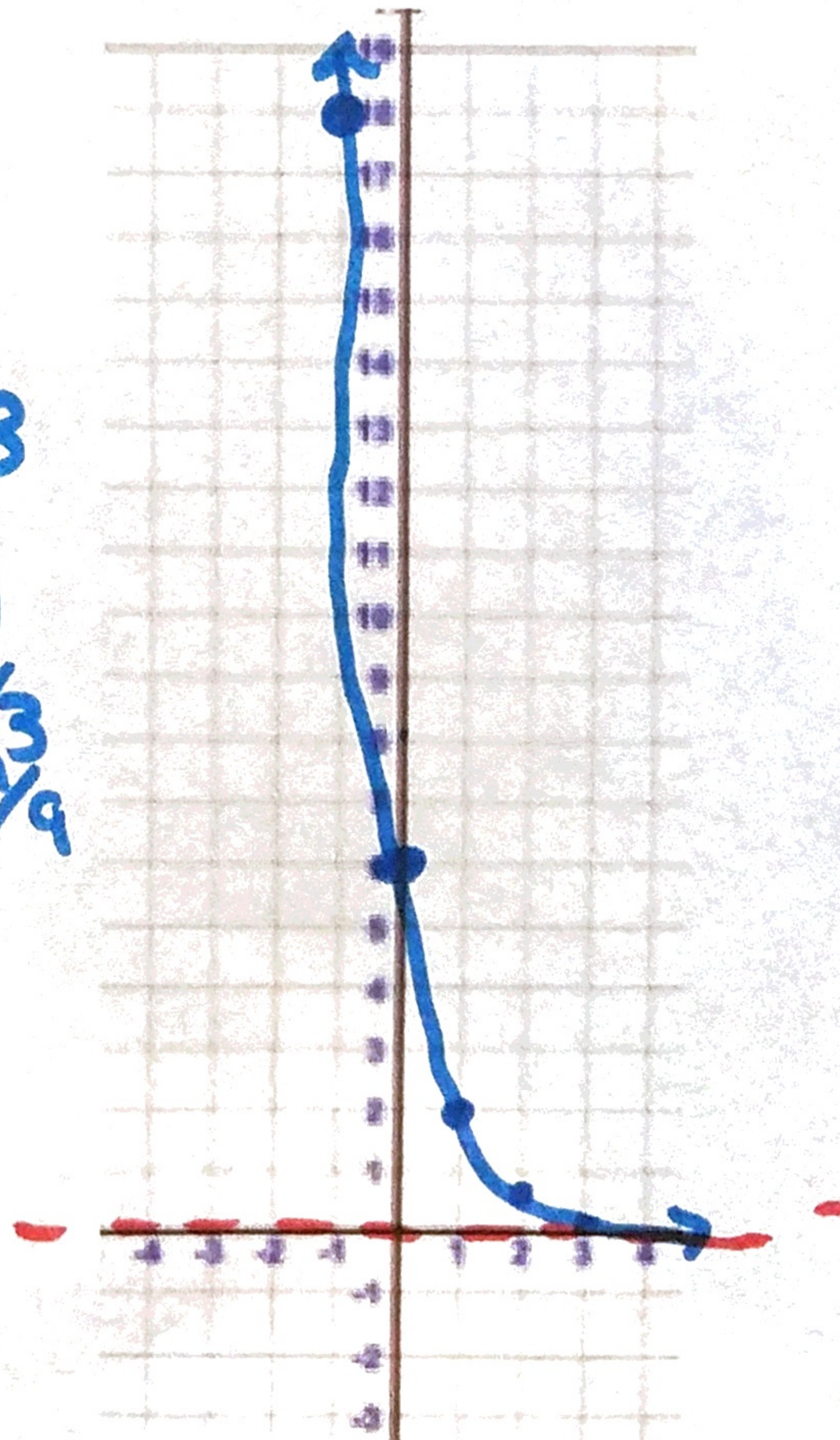| x	g(x)
-1	18
0	6·⅓
1	2·⅓
2	2/3
3	2/9

$6\left(\frac{1}{3}\right)^{-1} = 6 \cdot 3$
$6\left(\frac{1}{3}\right)^0 = 6 \cdot 1$
$6\left(\frac{1}{3}\right)^1 = 6 \cdot \frac{1}{3}$
$6\left(\frac{1}{3}\right)^2 = 6 \cdot \frac{1}{9}$

This is exponential **decay**

because **b = ⅓   ⅓ < 1**

What is the equation of the asymptote? **y = 0**

What is the domain? **(-∞, ∞)**

3. $j(x) = 4 \cdot \left(\dfrac{2}{3}\right)^x$

x	j(x)
-1	6
0	4
1	8/3
2	16/9
3	32/27

$4 \cdot (2/3)^{-1} = 4 \cdot \dfrac{3}{2}$

$4 \cdot (2/3)^1 = 8/3$

$4(2/3)^2 = 4 \cdot \dfrac{4}{9}$

$4(2/3)^3$
$= 4 \cdot \dfrac{8}{27}$

This is exponential **decay**

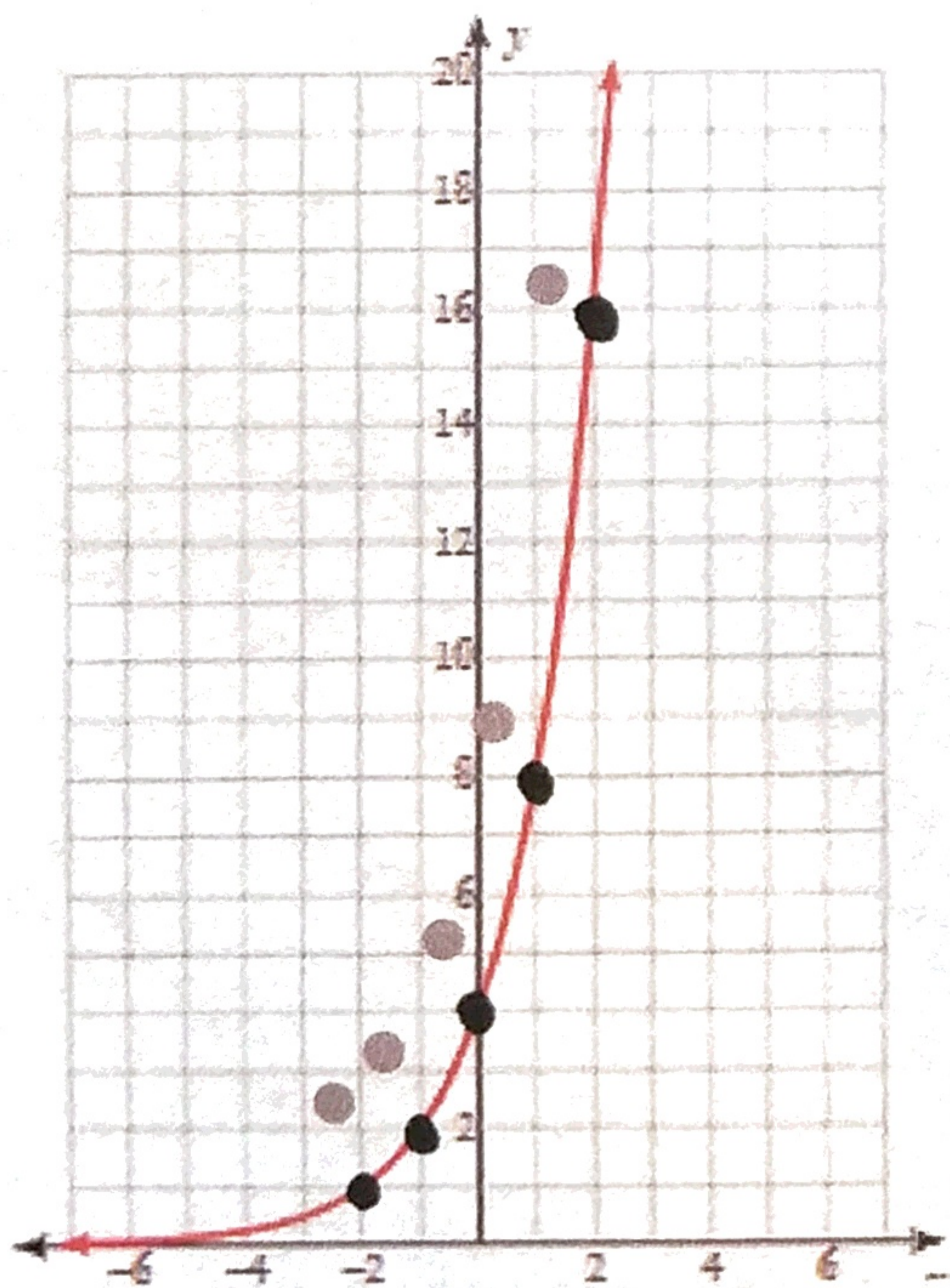because **$b = 2/3$ & $2/3 < 1$**.

$y = 0$
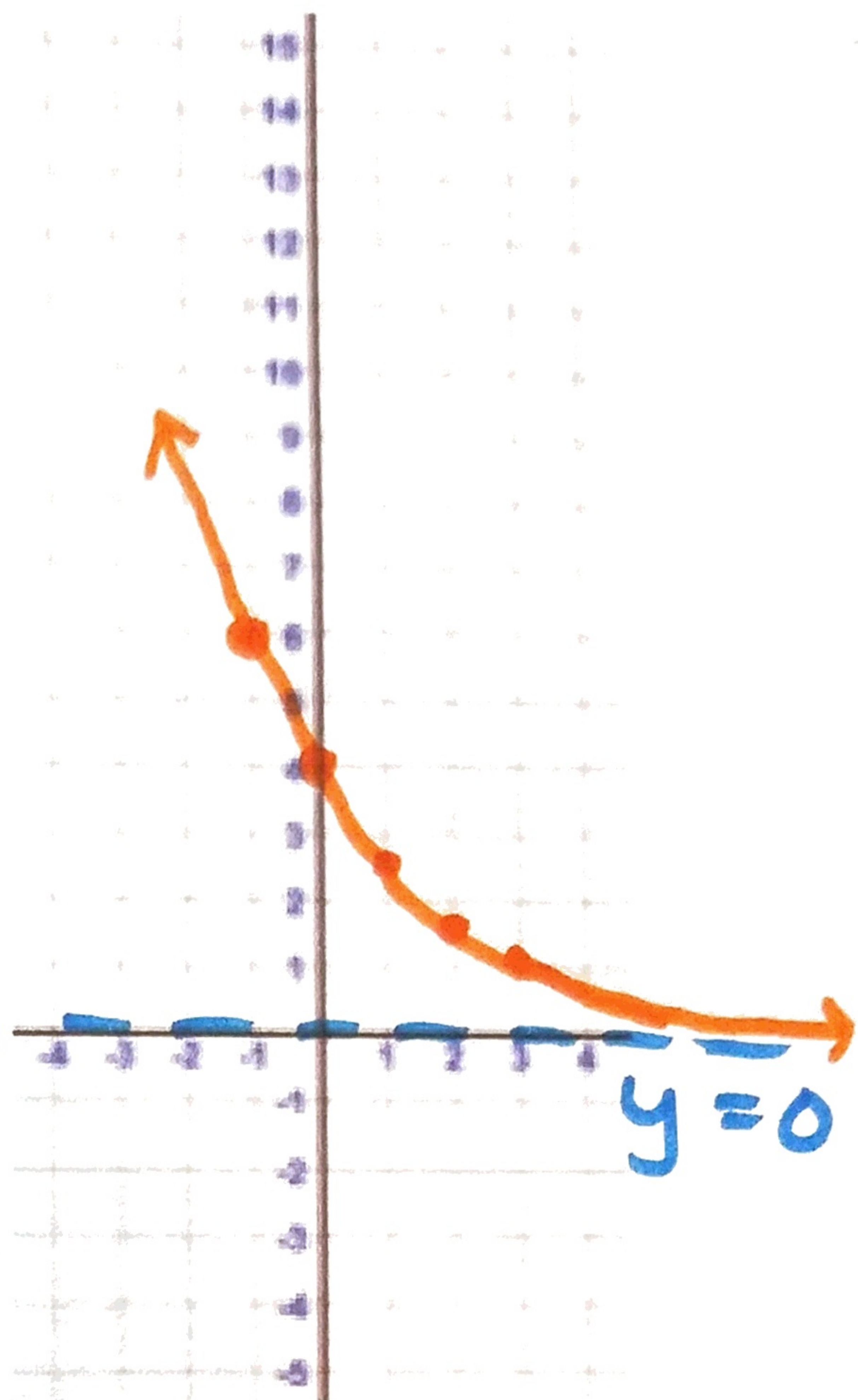
B. Graphs to equations

Just like making a table was a good step when going from the equation to the graph, it is good to make a table when going from a graph to an equation.

For each graph below, make a table and then give the equation.

$f(x) = a \cdot b^x$

1.

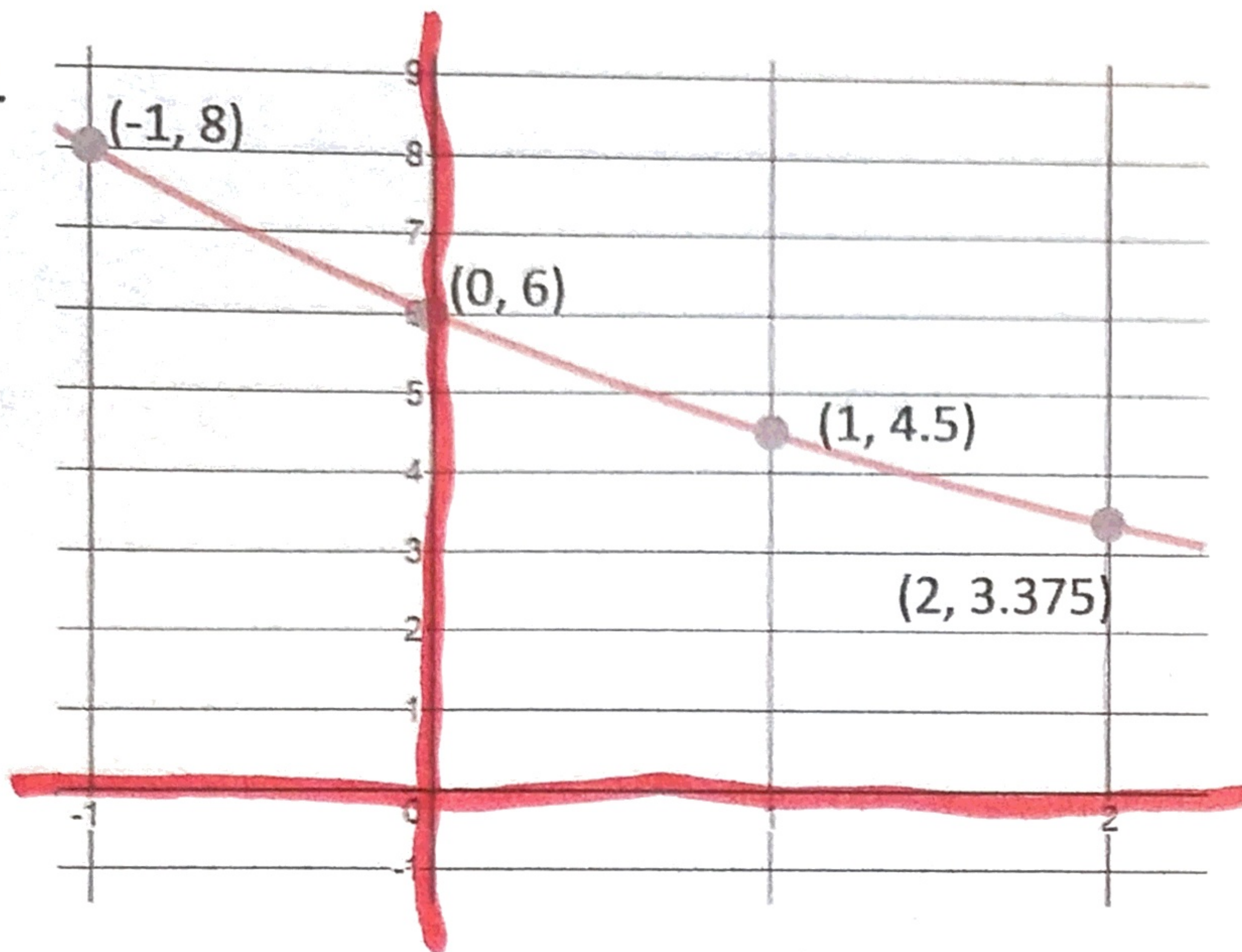| x	f(x)	
-2	1	·2
-1	2	·2
0	4	·2
1	8	·2
2	16	·2

The equation is

$f(x) = 4 \cdot 2^x$

*To find out what you are multiplying by, you actually do **division**

For example: 16/8 = 2 and 8/4 = 2 and 4/2 = 2 and 2/1 = 2

This is an important note b/c it is NOT always obvious what you are multiplying by!

2.

Graph points: (-1, 8), (0, 6), (1, 4.5), (2, 3.375)

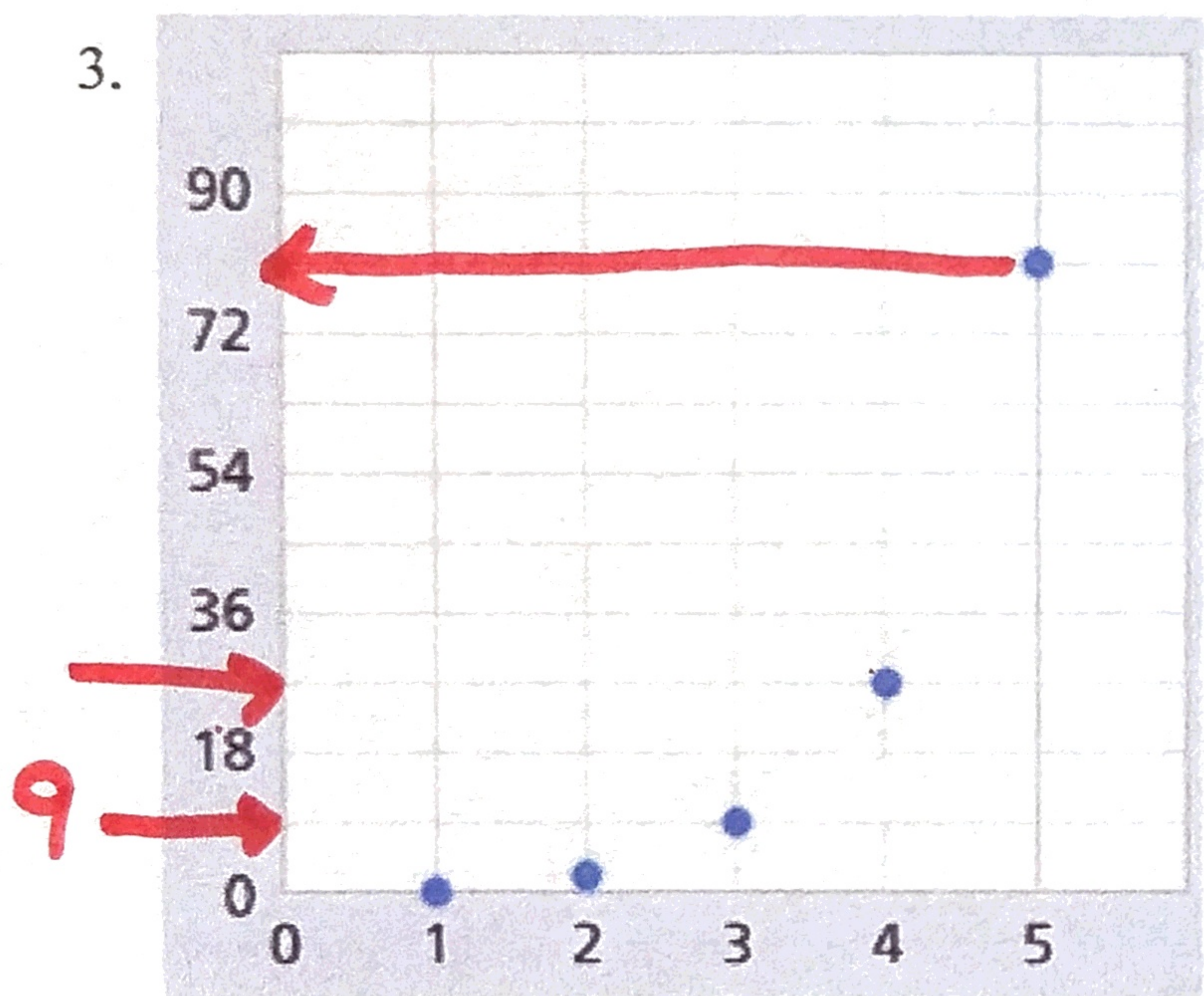| x	f(x)
-1	8
0	6 ←
1	4.5
2	3.375

$f(x) = a \cdot b^x$

The equation is

$$f(x) = 6 \cdot \left(\tfrac{3}{4}\right)^x$$

$8 \cdot ? = 6$

$\tfrac{6}{8} \to \tfrac{3}{4}$

$\dfrac{4.5 \cdot 2}{6 \cdot 2} = \dfrac{9}{12} \Rightarrow \tfrac{3}{4}$

3.

x	f(x)
0	$\tfrac{1}{3}$
1	1
2	3
3	9 $\cdot 3$
4	27 $\cdot 3$
5	81 $\cdot 3$

The equation is

$$f(x) = \tfrac{1}{3} \cdot 3^x$$

$f(x) = a \cdot b^x$