

8.7 - Exponential Functions

Vocabulary:

Exponential

Growth *increase*

Decay *decrease*

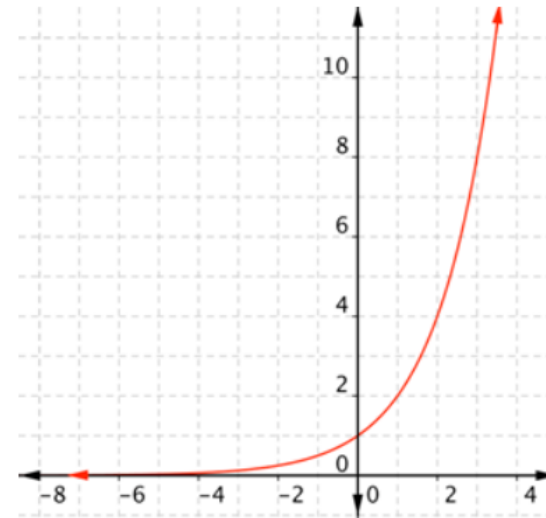
Domain/Range

input output

x

y

$$y = a \cdot b^x$$



$$y = 3^3$$

1 EXAMPLE Evaluate each exponential function.

a. $y = 3^x$ for $x = 2, 3, 4$

x	y
2	9
3	27
4	81

$$y = 3^2$$

$$y = 3^4$$

b. $p(q) = 3 \cdot 4^q$ for the domain $\{-2, 3\}$

x	y
-2	$3 \cdot 4^{-2}$ $\frac{3}{4^2}$ 16
3	$3 \cdot 4^3$ 192

Evaluate the exponential function for the given domain.

$$3. y = 20 \cdot (0.5)^x \text{ for } x = 3$$

$$y = 20 \cdot (0.5)^3$$

$$= 20 \cdot 0.125$$

$$= 2.5$$

2 EXAMPLE

Suppose two mice live in a barn. If the number of mice quadruples every 3 months, how many mice will be in the barn after

2 years?

$$y = a \cdot b^x$$

$$y = 2 \cdot 4^x$$

$$y = 2 \cdot 4^8$$

131,072 mice

4 3-month
increments
in 1
year

9. **Finance** Suppose an investment of \$10,000 doubles in value every 13 years.
How much is the investment worth after 52 years? After 65 years?

$$y = a \cdot b^x$$

↑
starting
value

$$y = 10,000 \cdot 2^5$$

$$= \$320,000$$

$$y = 10,000 \cdot 2^x$$

$$y = 10,000 \cdot 2^4$$

$$y = \$160,000$$

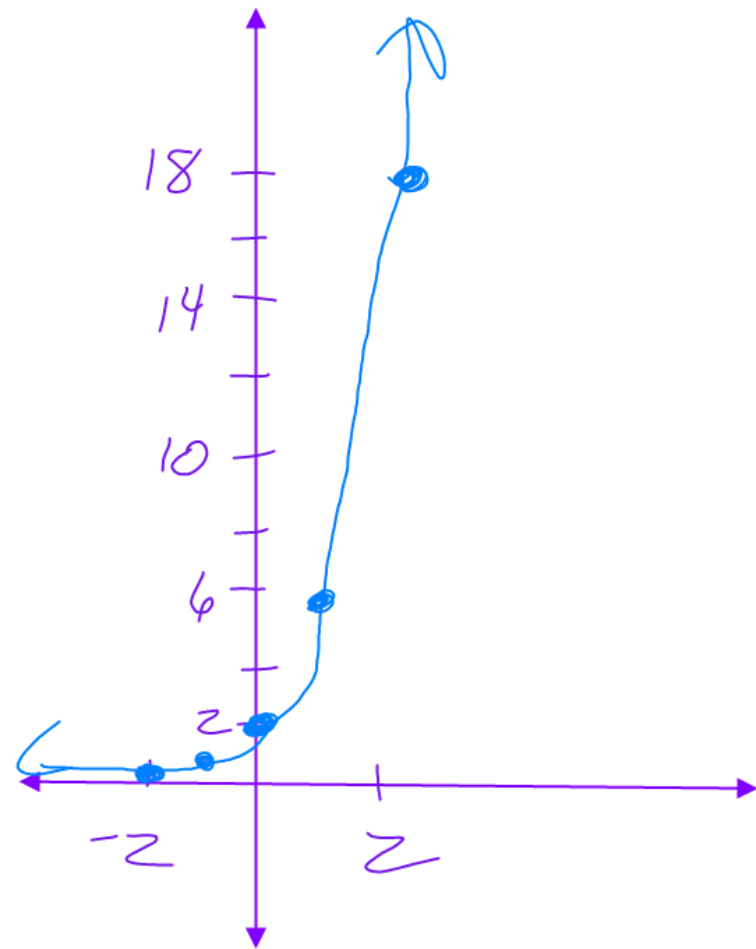
$$\leftarrow 52 : 13 = 4$$

3 EXAMPLE Graph $y = 2 \cdot 3^x$.

x	y
-2	$\frac{2}{9}$
-1	$\frac{2}{3}$
0	2
1	6
2	18

$$2 \cdot 3^1$$

$$2 \cdot 3^2$$



Graph each function.

19. $y = 10 \cdot 2^x$

2^b :

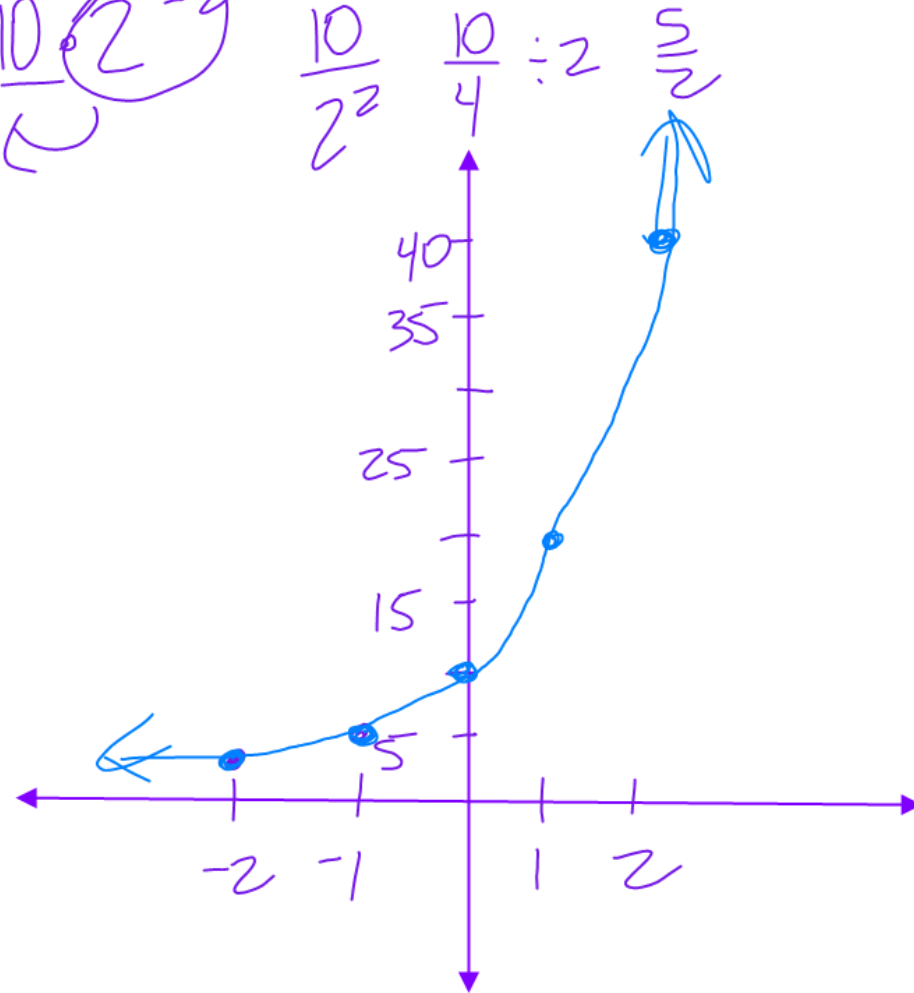
$$\frac{10}{2} \cdot 2^{-2}$$

$$\frac{10}{2^2}$$

$$\frac{10}{4} \div 2$$

$$\frac{5}{2}$$

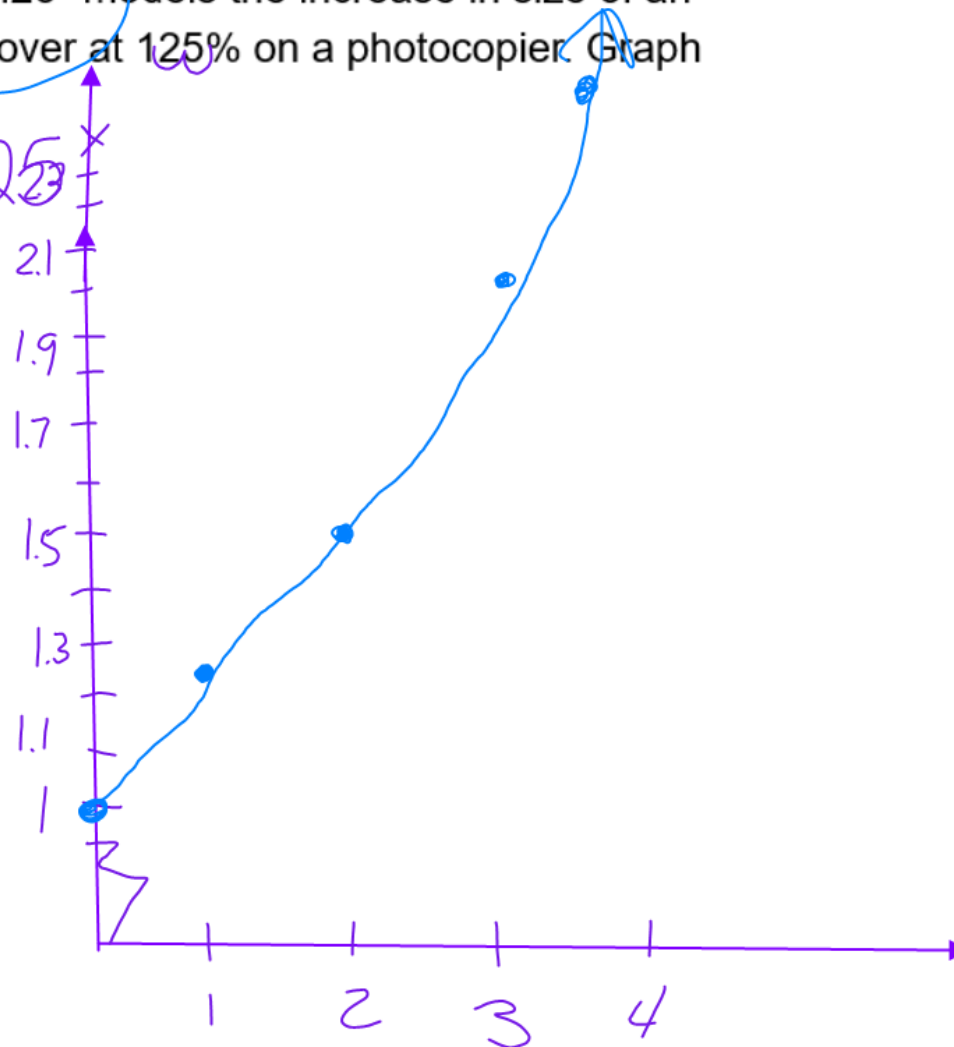
x	y
-2	$5/2 = 2^{1/2}$
-1	5
0	10
1	20
2	40



4 EXAMPLE The function $f(x) = 1.25^x$ models the increase in size of an image being copied over and over at 125% on a photocopier. Graph the function.

$$f(x) = 1.25^x$$

x	y
0	1
1	1.25
2	1.5625
3	1.953125
4	2.44140625



Homework: pg. 470 #4, 8, 10, 12-14, 16, 18, 21, 24, 56, 59