

Equation of an Exponential Function

Goal:

- to determine the equation (rule) for any exponential function
 - from a table of values
 - from a graph
 - from a word problem

From a table of values:

$$y = ac^x$$

a = initial value

c = base

x	y
-1	5
0	1
1	1/5
2	1/25

1. Find the base

$C = \text{any } y\text{-value} \div \text{previous } y\text{-value}$

$$C = \frac{1/5}{1} = \frac{1}{5}$$

2. Find the initial value

$$a = 1$$

3. Write the rule

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

x	y
2	-18
3	-54
4	-162
5	-486

1. Find the base

$$C = \frac{-162}{-54} = 3$$

2. Find the initial value

↳ Write the rule with what you have

$$y = a(3)^x$$

↳ Plug into x and y any point

$$\begin{matrix} x & y \\ (2, -18) & -18 = a(3)^2 \end{matrix}$$

for example

↳ solve for "a"

$$-18 = a(9)$$

$$-18 = 9a$$

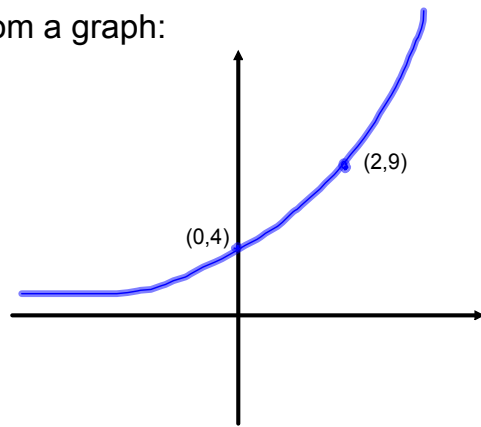
$$\frac{-18}{9} = \frac{9a}{9}$$

$$-2 = a$$

3. Write the rule

$$y = -2(3)^x$$

From a graph:



1. Cannot find base immediately
2. Find initial value
 $a = 4$

3. Write the rule with what you have

$$y = 4c^x$$

↳ Plug in any point (not initial value)

$$(2, 9) \quad 9 = 4c^2$$

↳ solve for "c"

$$\frac{9}{4} = \frac{4c^2}{4}$$

$$\frac{9}{4} = c^2$$

$$\sqrt{\frac{9}{4}} = \sqrt{c^2}$$

$$\frac{3}{2} = c$$

4. Write the rule

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

From a word problem:

A cold virus starts with 5 bacteria and the number of bacteria doubles every hour.

x : time (hours)

y : # bacteria

initial value $a = 5$ (amount of bacteria at start)

base $c = 2$ (bacteria doubles every hour)

$$y = 5(2)^x$$

You deposit \$200 into a mutual fund and expect to earn 8% interest each year.

x : time (years)

y : Amount of money in mutual fund (\$)

initial value $a = 200$ (\$200 at start)

base $c = 1.08$ (each year you gain 8%.
 $100\% + 8\% = 108\%$)

$$c = \frac{108}{100}$$

$$y = 200(1.08)^x$$

* if you lose 8%.

$$100\% - 8\% = 92\% *$$

$$= 0.92$$

Homework: p.43 #5-7,9

+ correct test