

# Exponential Functions

Goal:

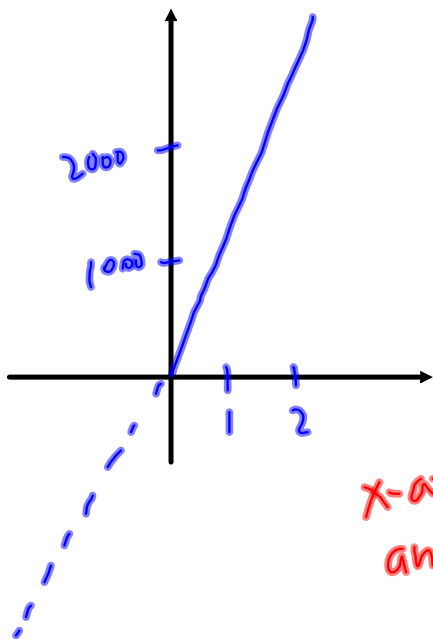
- to recognize and understand the basic characteristics of an **exponential function**

A hypothetical:

Would you rather receive \$1000 a day for 15 days or \$1 today and double it everyday for the next 15 days?

X	Y
0	0
1	1000
2	2000
3	3000
4	4000
...	...
15	15000

$$y = 1000x$$



X	Y
0	1 = 2 <sup>0</sup>
1	2 = 2 <sup>1</sup>
2	4 = 2 <sup>2</sup>
3	8 = 2 <sup>3</sup>
4	16 = 2 <sup>4</sup>
5	32 = 2 <sup>5</sup>
...	...
15	2 <sup>15</sup> = 32 768

$$y = 2^x$$



The second option is an example of an exponential function. What makes a function exponential?

- grows rapidly
- graph comes closer and closer to x-axis
- y-values get multiplied by a number

ex:  $1, 3, 9, 27, 81, 243$   $y = 3^x$

$25, 5, 1, \frac{1}{5}, \frac{1}{25}, \frac{1}{125}$   $y = 25 \left(\frac{1}{5}\right)^x$

The rule for a basic exponential function can be written as:

$$y = ac^x$$

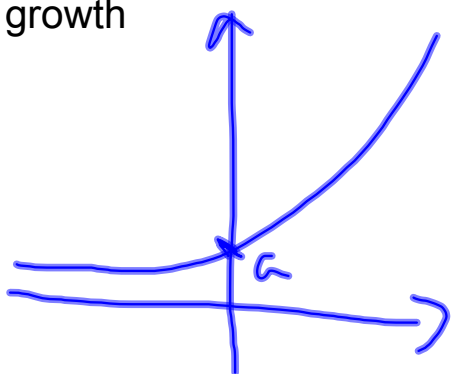
where

$a$  = initial value

$c$  = base  
(multiplier)

We have two major types of exponential functions:

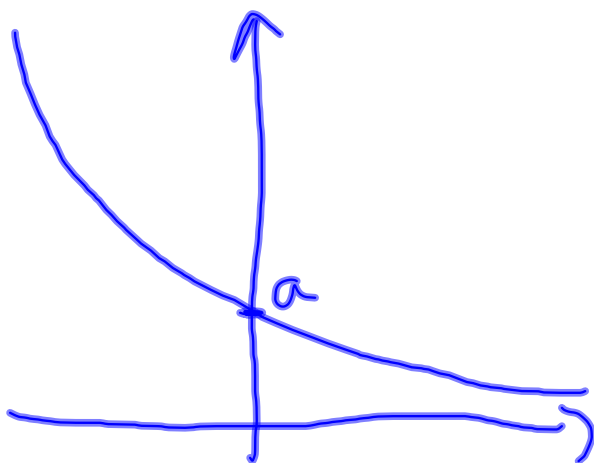
1. growth



C must be  
greater than 1

$$C > 1$$

2. decay

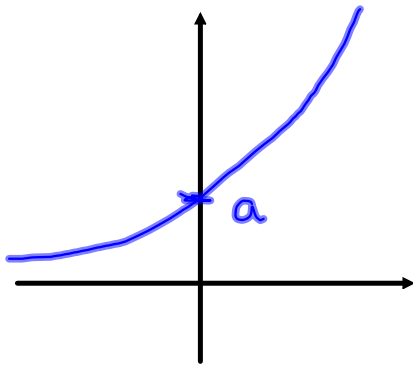


C must be  
less than 1

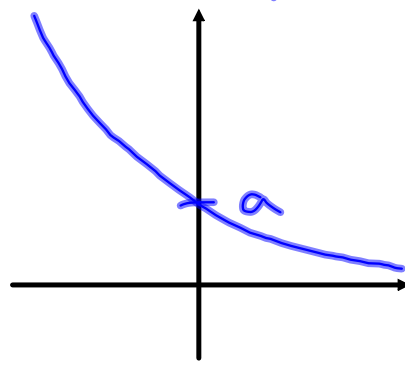
$$C < 1$$

There are four possible types of graphs that can result:

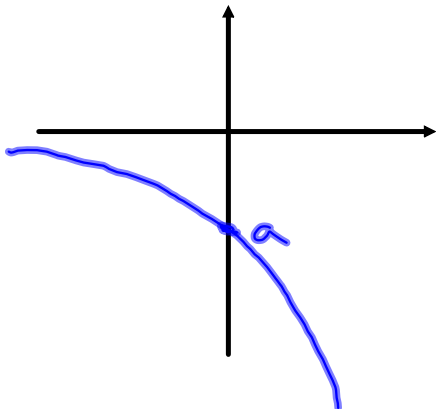
$$a > 0 \quad c > 1$$



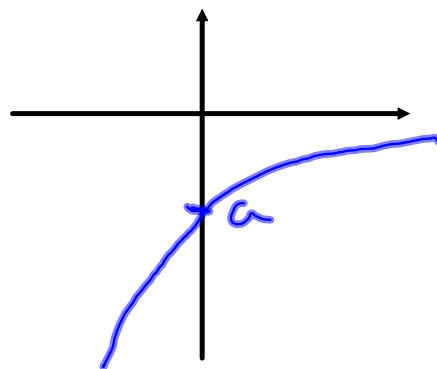
$$a > 0 \quad c < 1$$



$$a < 0 \quad c > 1$$



$$a < 0 \quad c < 1$$



Homework p. 42 # 1 optional

# 3, 4,

# 2 \* go over  
in class

# 3.a) 6, 18, 54, 162, 486



The diagram shows a sequence of numbers: 6, 18, 54, 162, 486. Green arrows point from each number to the next, with 'x3' written below each arrow, indicating that each term is multiplied by 3 to get the next term.

$$C = \frac{18}{6} = 3$$

$$a = 6$$

$$y = 6(3)^x$$