

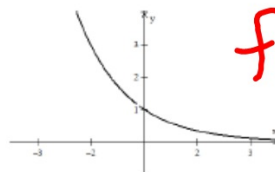
## VOCABULARY

**Exponential function** – any function written in the form  $y = ab^x$ , where  $x$  is a real number,  $a \neq 0$ ,  $b > 0$ , and  $b \neq 1$ . If  $b > 1$ , the function models exponential growth with a growth factor  $b$ . When  $0 < b < 1$ , the function models exponential decay with decay factor  $b$ .

**Exponential growth** – any function in the form  $y = ab^x$  with  $b > 1$

**Exponential decay** – any function in the form  $y = ab^x$  with  $0 < b < 1$

$f(x) = 2^x$   
Growth



$f(x) = (\frac{1}{2})^x$   
Decay

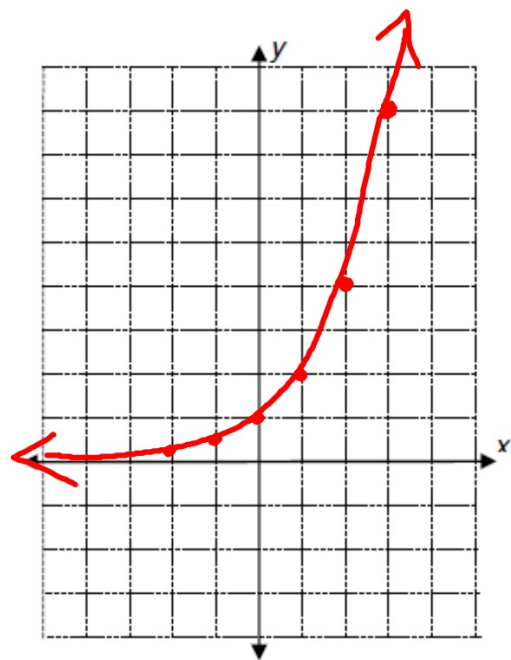
**Asymptote** – a line that a graph approaches as  $x$  or  $y$  increases in absolute value.

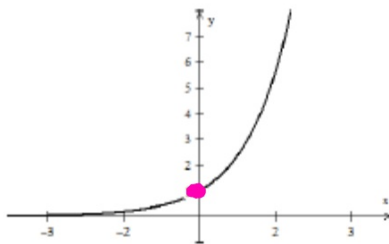
**Growth factor** – in an exponential function of the form  $y = ab^x$ ,  $b$  is the growth factor if  $b > 1$ .

**Decay factor** – in an exponential function of the form  $y = ab^x$ ,  $b$  is the decay factor if  $0 < b < 1$ .

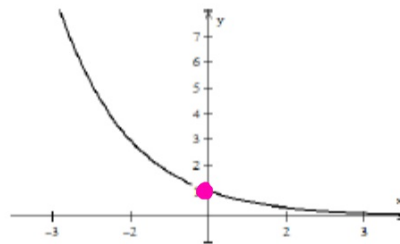
**EX #1:** Graph  $y = 2^x$

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





Growth



Decay

Domain:  $(-\infty, \infty)$  For both

Range: Growth:  $(0, \infty)$  Decay:  $(0, \infty)$

Asymptote:  $y = 0$  for both

Key Points:  $y$ -intercept  $(0, 1)$   
No  $x$ -intercepts

**EX. #2:** Identify each of the following as an example of exponential growth or decay. Explain how you know. What is the y-intercept?

A.  $y = 3(4^x)$

$$y = ab^x$$

$$b = 4$$

$4 > 1$  Growth

y-int:  $(0, 3)$   
(plug 0 in for x.)

B.  $y = 11(0.75^x)$

$$y = ab^x$$

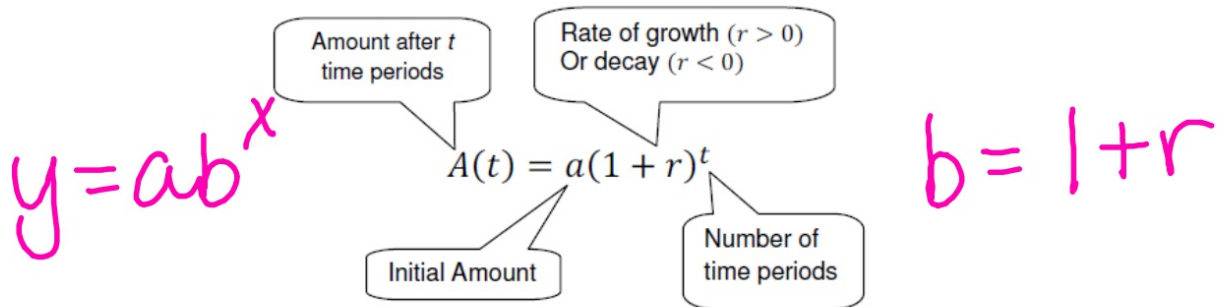
$$b = 0.75$$

$0 < 0.75 < 1$  Decay

y-int:  $(0, 11)$

- C. You save \$2000 into a college savings account for four years. The account pays 6% interest annually.

Growth  
 $b > 1$



**EX. #3:** Suppose you invest  <sup>$a$</sup>  \$500 in a savings account that pays 3.5% annual interest. How much will be in the account after five years?

Growth

$$b = 1 + 0.035$$

$$b = 1.035$$

$$y = 500(1.035)^x$$

$$y = 500(1.035)^5$$

$$y = \$593.84$$