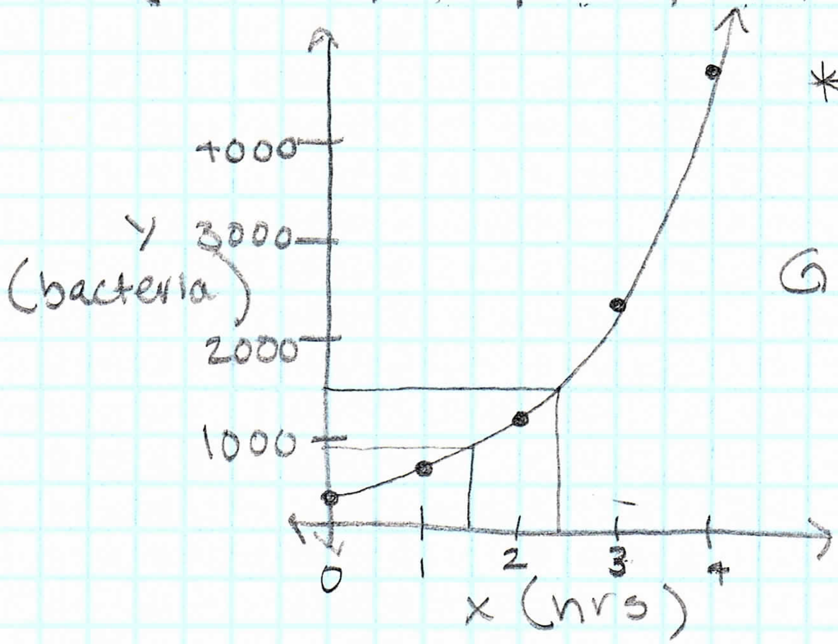
Lsn. 9-1: Exponential Growth

EX → experiment begins with 300 bacteria

→ population doubles every hour

x (hours)	0	1	2	3	4
y (# of bacteria)	300	600	1200	2400	4800



* as x increases by 1, y doubles

GEOMETRIC SEQUENCE

$y = 300(2)^x$

→ what is pop at time 1.5 hours?

$y = 300(2)^{1.5} = \boxed{848.53 \text{ bacteria}}$

→ what was pop 2 hrs before experiment began?

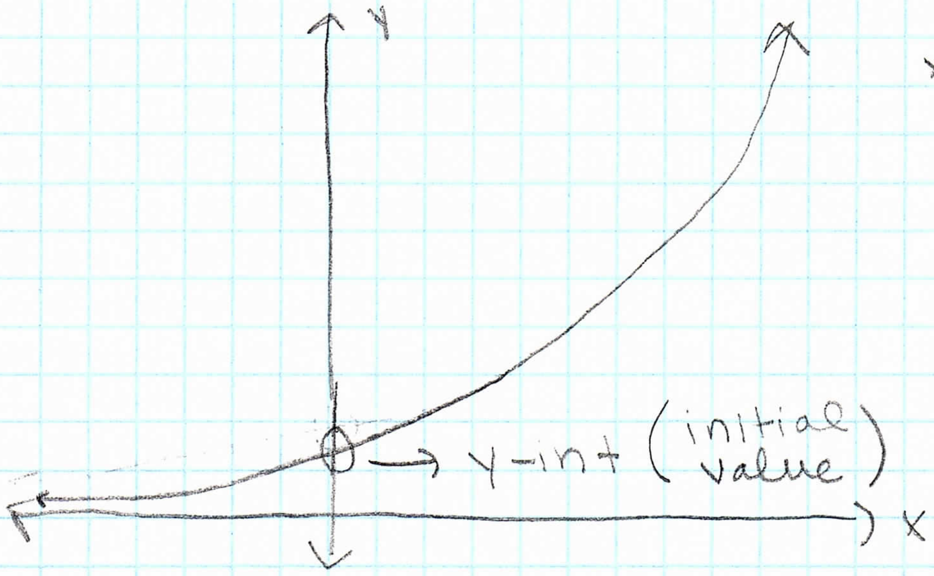
$y = 300(2)^{-2} = \boxed{75 \text{ bacteria}}$

→ after how much time will pop be 1500?

$1500 = 300(2)^x$

$\begin{cases} y = 1500 \\ y = 300(2)^x \end{cases}$ intersections $\boxed{x = 2.32 \text{ hrs}}$

EXPONENTIAL GROWTH CURVES



* notice that the graph never touches or crosses the x-axis, the x-axis is called the **ASYMPTOTE**

DOMAIN → $\mathbb{R}$, RANGE → positive $\mathbb{R}$

DEFINITION

A fontion f defined by the equation

$$f(x) = ab^x \quad (a \neq 0, b > 0, b \neq 1)$$

is an EXPONENTIAL FUNCTION

$$Y = ab^x$$

x — time

a → initial value (y-int)

b → Growth factor ($b > 1$)

$1 + r$

EX → in 2000, 360 deer in forest, assuming a growth factor of 1.5, how many will there be in 2020?

$$Y = ab^x = 360(1.5)^{20} = \boxed{1,197,092}$$

EX → in 1993, US pop was about 258 million, assuming a constant rate of 1% annually, how many people will there be in 2015?

$b = 1 + r$
$= 1 + .01$
$= 1.01$

$y = ab^x = 258(1.01)^{22}$

$= \boxed{321 \text{ million}}$

$$\begin{array}{r} 2015 \\ -1993 \\ \hline 22 \end{array}$$

→ when will pop reach 400 million?

$y = ab^x$

$400 = 258(1.01)^x$

$$\begin{cases} y = 400 \\ y = 258(1.01)^x \end{cases}$$

$x = 44$

$$\begin{array}{r} 1993 \\ +\ 44 \\ \hline \boxed{2037} \end{array}$$