7-1: Explore Exponential Models

Objective: To model exponential growth and decay.

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

initial value
(y-intercept)

growth/decay factor
growth: when $b > 1$
decay: when $0 < b < 1$

Ex. Identify each function as growth or decay. Also, what is the y-intercept?

1. $y = 12(.85)^x$

$y = 12$ decay

2. $y = 0.5(2)^x$

$y = 0.5$ growth

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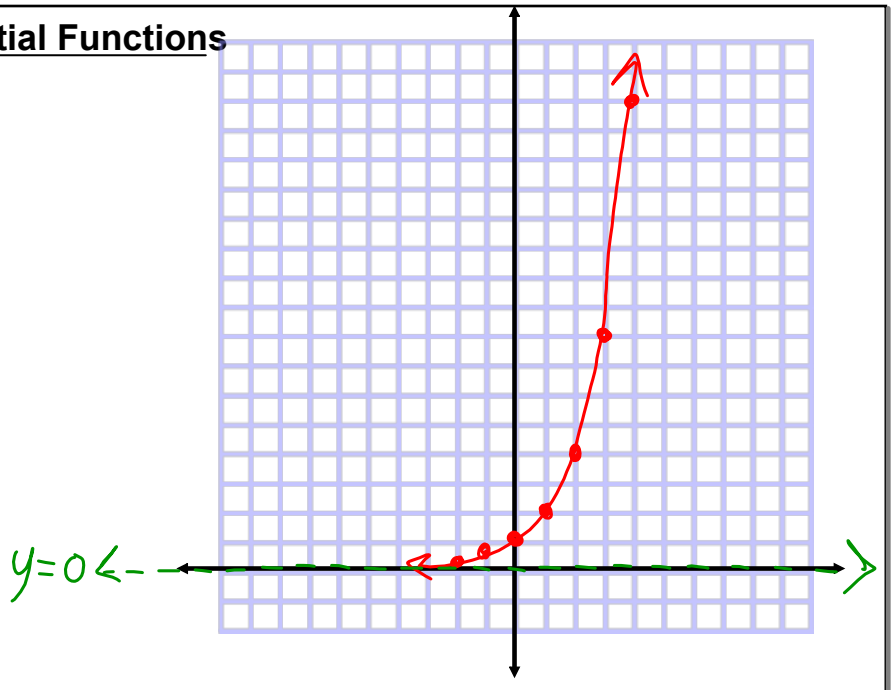
Graphing Exponential Functions

Ex. $y = 2^x$

x	y
0	1
1	2
2	4
3	8
4	16
-1	0.5
-2	0.25



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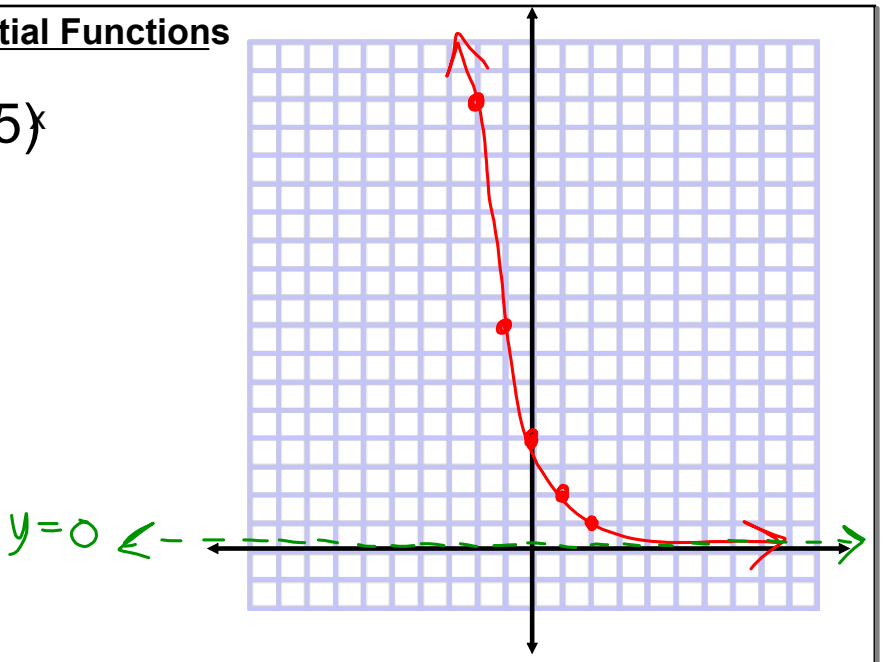
Graphing Exponential Functions

Ex. $y = 4(0.5)^x$

$y = (0.5)^x$

stretch by 4



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Alternate Exponential Growth/Decay Model

$$y = a(1 +_{\text{or}} - r)^x$$

initial value/amount

rate of growth or decay
(positive) (negative)

number of time periods (t)

Ex. Part 1.

You invested $1000 in a savings account at the end of 6th grade. The account pays 5% annual interest. How much money will be in the account after six years?

$y = 1000(1+.05)^6$ → $1340.10

Ex. Part 2.

How many years will it be until the account has at least $3000 in it?

23 yrs.

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Ex. Write an exponential function modeling this situation.

There is currently a population of 5,200 polar bears in the Arctic Americas. That population has been decreasing by about 7.5 % each year.

a.) If this trend continues, how many will remain in 50 years?

$y = 5200(1 - .075)^{50}$

$y = 105.46 \rightsquigarrow$ 105 bears

b.) When will this population reach levels of less than 25 polar bears?

68 → 69 yrs.

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Endangered Species The table shows the world population of the Iberian lynx in 2003 and 2004. If this trend continues and the population is decreasing exponentially, how many Iberian lynx will there be in 2014?

World Population of Iberian Lynx		
Year	2003	2004
Population	150	120

Use the general form of the exponential equation, $y = ab^x = a(1 + r)^x$.

$r = \frac{(150 - 120)}{150} = .20$

11 yrs.

$y = 150(1 - .20)^{11}$

$y = 12.5 \rightarrow$ 12–13 lynx

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Ex.

A culture of bacteria was started 12 hours ago, and the number is now 500,000. This strain of bacteria has a growth rate of 75%. About how many bacteria where in the initial culture?

$$\frac{500{,}000}{(1+.75)^{12}} = \frac{a\cdot(1+.75)^{12}}{(1+.75)^{12}}$$

$a = 606$

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HW:

p. 439:

#'s: 10,14,20,21,23,26,27,28,29,32,46

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