

Section 7 - 6 Exponential Function

Students will be able to evaluate and graph exponential functions.

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Getting Ready!

Your soccer team wants to practice a drill for a certain amount of time each day. Which plan will give your team more total practice time over 4 days? Over 8 days? Explain your reasoning.

Plan 1
5 minutes today and then 1 minute more each day than the previous day

Plan 2
1 minute today and then twice as much time each day as the previous day

Handwritten notes:
4 days Plan 1 > total min. 8 days Plan 2 > 33 min

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Some functions model an initial amount that is repeatedly multiplied by the same positive number.

-the independent variable is an exponent

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Key Concept Exponential Function

Definition
An exponential function is a function of the form $y = a \cdot b^x$, where $a \neq 0$, $b > 0$, $b \neq 1$, and x is a real number.

Examples

Handwritten notes:
exp growth: $y = 2^x$, $y = -2^x$
exp decay: $y = \frac{1}{2}^x$, $y = -\frac{1}{2}^x$

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Suppose the x-values in a table have a common difference.

If the y-values have a common difference, the function is linear.

If the y-values have a common ratio, the function is exponential.

x	1	2	3	4
y	10	15	20	25

Handwritten notes: 5, 5, 5, 5

1	2	3	4
3	9	27	81

Handwritten notes: 3, 3, 3, 3
6 18

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Is it linear or exponential?

x	0	1	2	3
y	1	2	4	8

Handwritten notes: .2 .2 .2

Handwritten notes: exp. → common ratio

$y = 3^x$

Handwritten notes: exp → by def. of exp functions

$y = 2x$
 $x = \frac{1}{2}y$ } linear

$y = 2x^3$

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An initial population of 20 rabbits triples every half year. The function $f(x) = 20 \cdot 3^x$ gives the population after half-year periods. How many rabbits will there be after 3 years?

$$f(x) = 20 \cdot 3^x$$

$$20 \cdot 3^6 = 14,580 \text{ bunnies}$$

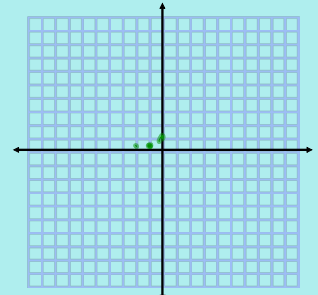
$$20 \cdot 729$$

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What is the graph of $y = .5 \cdot 3^x$?

What is the graph of $y = -.5 \cdot 3^x$?

x	4		
-2	.05	=	$.5 \cdot 3^{-2}$
-1	.16	=	$.5 \cdot 3^{-1}$
0	.5	=	$.5 \cdot 3^0$
1	1.5	=	$.5 \cdot 3^1$
2	4.5	=	$.5 \cdot 3^2$



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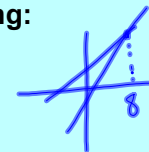
Suppose an investment of \$7500 doubles in value every 12 years. The function $f(x) = 7500 \cdot 2^x$ models the growth of the investment. Graph the function.

We are going to look at how to use a graph to help solve an equation.

Solve by graphing:

$$2x - 7 = x + 1$$

$$x = 8$$



Now solve an exponential function by graphing:

$$1.25^x = -2x$$

$$1.25^x$$

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#8 - 11 all, 14 - 26 evens,

30 - 32 all, 34, 42 - 46 evens,

51 - 54 all

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