LESSON MAKER PRO

Exponential Story Graphs

Model change, read graphs, and name context limits.

HIGH SCHOOL · MA.912.AR.5.7

MA.912.AR.5.7 "Solve and graph mathematical and real-world problems that are modeled with exponential functions. Interpret key features and determine constraints in terms of the context."

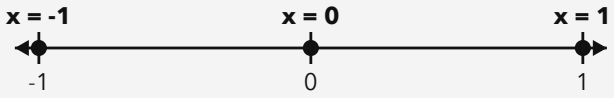
NAME _____ DATE _____

KEY GRAPH FEATURES

For $y = a(b)^x$, the y-intercept is a and the horizontal asymptote is $y = 0$ when there is no vertical shift. In a real situation, time usually starts at 0, so use $t \geq 0$ unless the context gives a stricter limit.

WORKED EXAMPLE

Use the marked x-values to find three points for graphing $y = 5(4)^x$.



1. At $x = -1$, $y = 5(4)^{-1} = 5/4$.
2. At $x = 0$, $y = 5(4)^0 = 5$.
3. At $x = 1$, $y = 5(4)^1 = 20$.

Answer: (-1, 5/4), (0, 5), (1, 20)

PRACTICE 4 problems

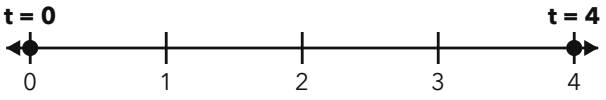
1 Solve: $81 = 3^{x+2}$.

ANSWER _____

2 For $y = 2^{x-1}$, state the y-intercept and horizontal asymptote.

ANSWER _____

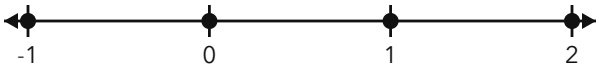
3 For $y = 6(1/2)^t$, use the two marked t-values. Find the corresponding y-values.



ANSWER _____

_____

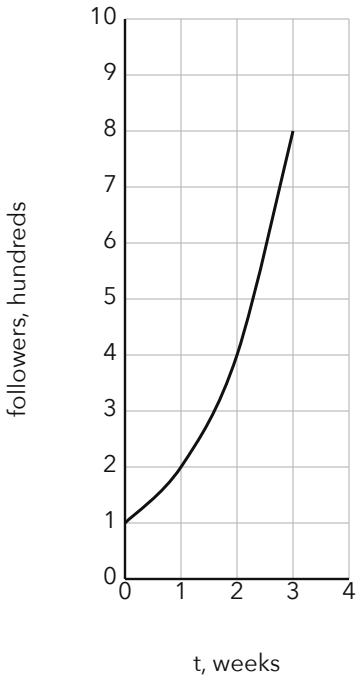
4 For $y = 9(1/3)^x$, which marked x-value gives y = 1?



ANSWER _____

APPLY IT Show your work

1 The graph shows a gaming club's followers, in hundreds, after t weeks. State the starting number of followers, the number after 3 weeks, and a sensible domain for t.



ANSWER _____

2 A phone starts at 96% battery and has half as much battery each hour. Write a model B(h), find B(3), and state a sensible domain for h.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two online campaigns have follower totals, in hundreds, modeled by $A(t) = 4(3)^t$ and $B(t) = 108(1/3)^t$. Find when they are equal. Explain why there is only one intersection for $t \geq 0$.

WORK SPACE AND ANSWER

Exponential Story Graphs

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve: $81 = 3^{x+2}$.	**x = 2**
2	For $y = 2^{x-1}$, state the y-intercept and horizontal asymptote.	**y-intercept: (0, 1/2); horizontal asymptote: y = 0**
3	For $y = 6(1/2)^t$, use the two marked t-values. Find the corresponding y-values.	**At t = 0, y = 6. At t = 4, y = 3/8.**
4	For $y = 9(1/3)^x$, which marked x-value gives y = 1?	**x = 2**

PART 2 · APPLY IT

1. **Start: 100 followers; after 3 weeks: 800 followers; domain: t ≥ 0.** Read 1 hundred at t = 0 and 8 hundreds at t = 3. Negative time is not meaningful.
2. **$B(h) = 96(1/2)^h$; B(3) = 12%; h ≥ 0.** The initial amount is 96 and the repeated factor is 1/2. Substitute h = 3, then restrict time to nonnegative values.

CHALLENGE

t = 3/2 weeks. Since A(t) increases and B(t) decreases for t ≥ 0, they can intersect only once.

Accept equivalent fractional forms and coordinate notation for graph features. For context domains, accept nonnegative real time unless a student reasonably states whole-number hours or weeks for a discrete measurement.