

Exponential Feature Hunt

Graph functions and identify what their features show.

HIGH SCHOOL • MA.912.AR.5.6

MA.912.AR.5.6 "Given a table, equation or written description of an exponential function, graph that function and determine its key features."

NAME _____

DATE _____

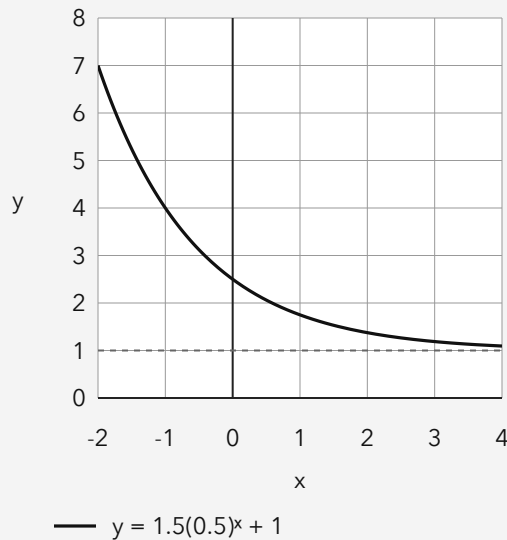
You will need: Pencil; Ruler

READ THE PATTERN

For $y = a(b)^{x-h} + k$, the horizontal asymptote is $y = k$. Use $x = 0$ to find the y-intercept, and check whether outputs grow or decay as x increases.

WORKED EXAMPLE

Study the graph. Identify the horizontal asymptote, y-intercept, growth or decay, domain, and range.

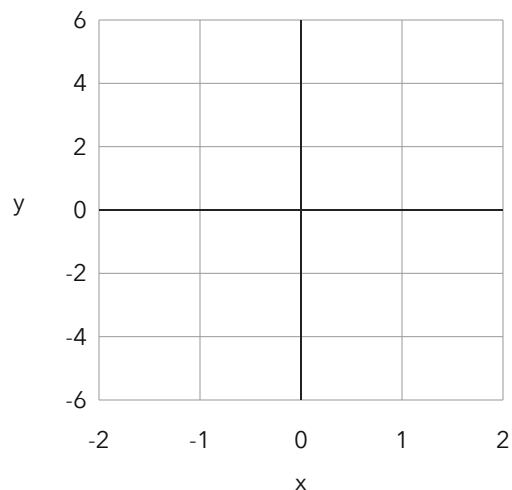


1. The curve gets closer to $y = 1$, so the asymptote is $y = 1$.
2. At $x = 0$, the graph has $y = 5/2$.
3. The outputs decrease as x increases.
4. The curve stays above $y = 1$.

Answer: Asymptote: $y = 1$. Y-intercept: $(0, 5/2)$. Decay. Domain: all real numbers. Range: $y > 1$.

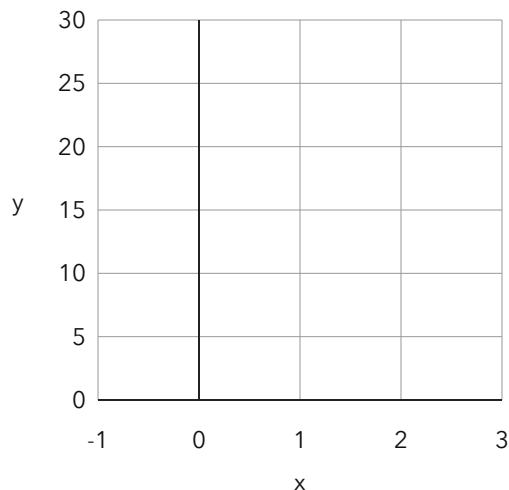
PRACTICE 4 problems

- 1** Graph $f(x) = 3^x - 4$. Give its horizontal asymptote and y-intercept.



ANSWER _____

- 2** Graph $g(x) = 5(1/5)^x + 2$. State growth or decay and give its range.



ANSWER _____

- 3** Write an exponential function with y-intercept $(0, 7)$, horizontal asymptote $y = 0$, and a factor of 3 for each increase of 1 in x .

ANSWER _____

- 4** For $h(x) = 4(1/2)^x - 1$, find $h(-1)$ and $h(2)$.

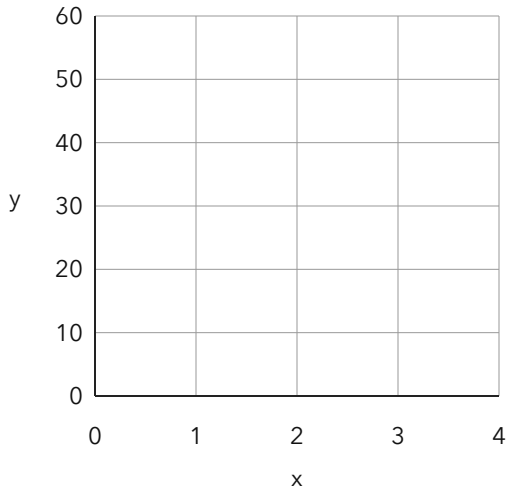
ANSWER _____

APPLY IT Show your work

1

The table shows followers of a school club account. F is in hundreds. Graph the points, then write a model and state its y -intercept, asymptote, and growth or decay. Use horizontal t (weeks) and vertical F (hundreds). State the model's asymptote when extended beyond the contextual domain $t \geq 0$.

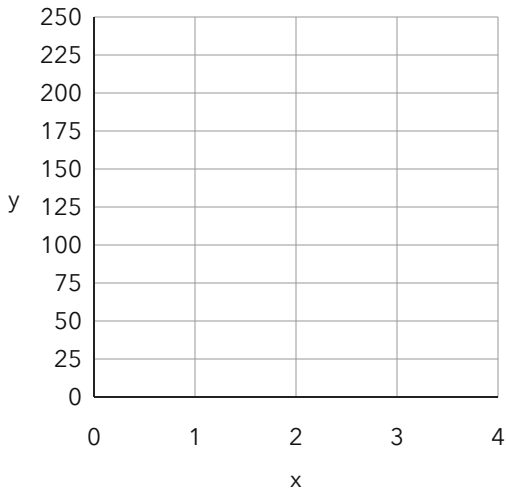
t (weeks)	F (hundreds)
0	6
1	12
2	24
3	48



REASONING AND ANSWER

2

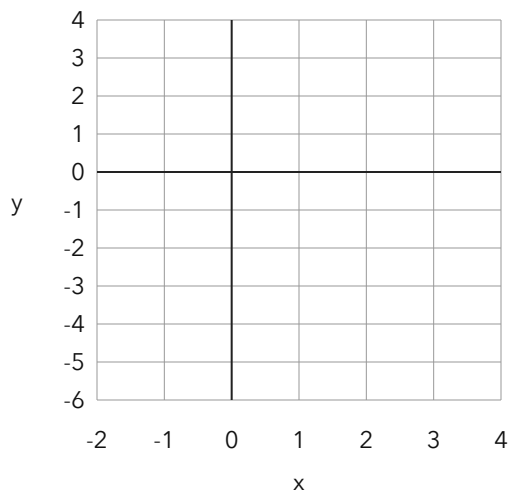
A student buys a used laptop for \$243. Its value becomes $\frac{1}{3}$ of the previous year's value. Write a model $V(t)$, graph the points for $t = 0, 1, 2$, and 3 , and give the y -intercept and horizontal asymptote. Use horizontal t (years) and vertical V (dollars); $t \geq 0$.



REASONING AND ANSWER

CHALLENGE One step up

For $p(x) = -2(1/2)^x + 3$, evaluate $x = -2, -1, 0, 1, 2$ and graph the function. State the asymptote, range and whether it increases or decreases. Explain the negative coefficient.



WORK SPACE AND ANSWER

PRACTICE 3

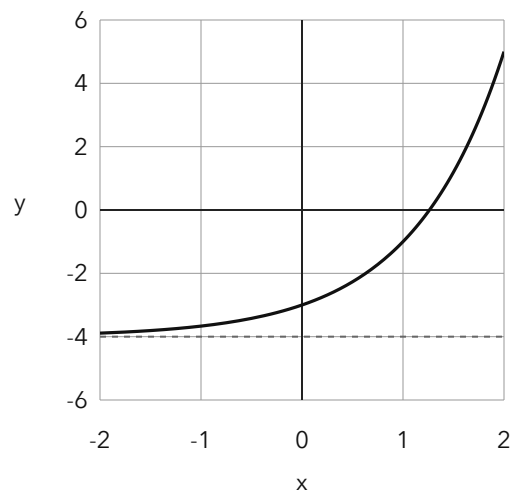
$$y = 7(3)^x$$

PRACTICE 4

$$h(-1) = 7; h(2) = 0.$$

PRACTICE 1

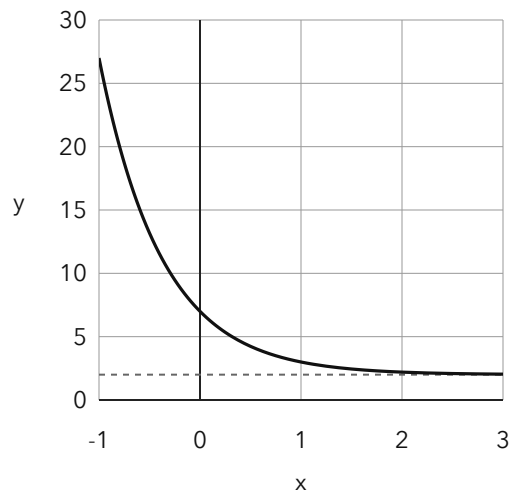
Asymptote: $y = -4$. Y-intercept: $(0, -3)$.



$$f(x) = 3^x - 4$$

PRACTICE 2

Decay; range: $y > 2$.

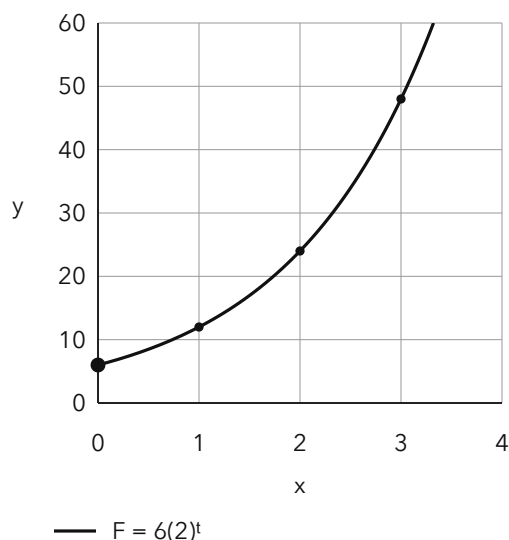


$$g(x) = 5(0.2)^x + 2$$

APPLY IT 1

$F = 6(2)^t$. Y-intercept: (0, 6), or 600 followers.

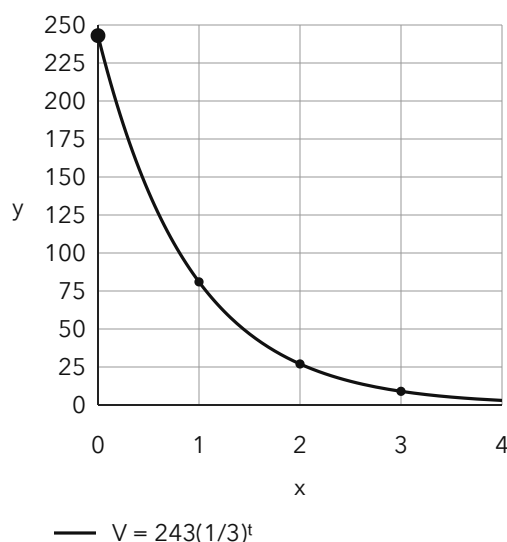
Horizontal asymptote: $F = 0$. Growth. The follower total doubles each week, so the base is 2. At $t = 0$, the table gives 6 hundreds.



APPLY IT 2

$V(t) = 243(1/3)^t$. Points: (0, 243), (1, 81), (2, 27), (3, 9). Y-intercept: (0, 243). Horizontal

asymptote: $V = 0$. Decay. Start with 243 at $t = 0$ and multiply by $1/3$ for each year. The values approach 0 without reaching it.



CHALLENGE

$p(-2) = -2(4) + 3 = -5$; $p(-1) = -2(2) + 3 = -1$; $p(0) = 1$; $p(1) = 2$; $p(2) = 5/2$. A negative exponent takes the reciprocal: $(1/2)^{-2} = 4$ and $(1/2)^{-1} = 2$. Asymptote: $y = 3$. Range: $y < 3$. The function increases; the negative coefficient reflects the positive decay model across $y = 3$.

Accept equivalent inequality notation for ranges, such as (1, infinity) or (-infinity, 3). For graphing tasks, accept accurate plotted points and a smooth exponential curve approaching the stated asymptote. Require actual curves and asymptote guides in graphing tasks. Context axes and nonnegative time are stated in the prompts; the axes use x/y positions with the stated units.

