Algebra IIB
Lesson: April 6, 2020

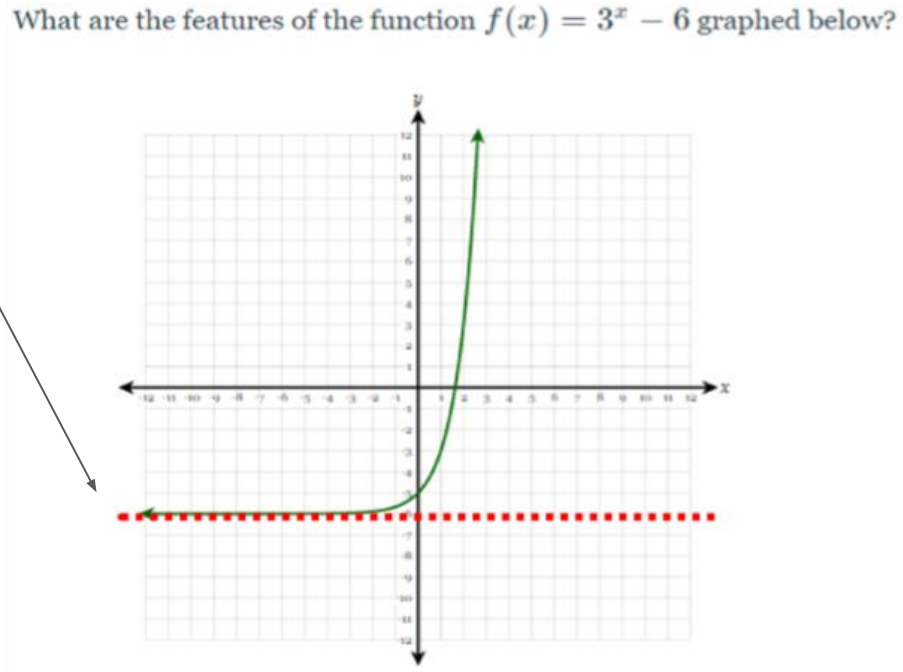
Learning Target:
Students will identify features of exponential graphs

Let's Get Started:
Watch Video: Characteristics of Exponential Functions

Features we are looking for:

ASYMPTOTE - The line the curve approaches but never crosses.

- In an exponential equation it is ALWAYS horizontal
- It is the constant at the end of the equation
- It is written y=-6



Features we are looking for:

END BEHAVIOR: Focus on the arrows on either end. If the curve continues, where will those arrows eventually end up?

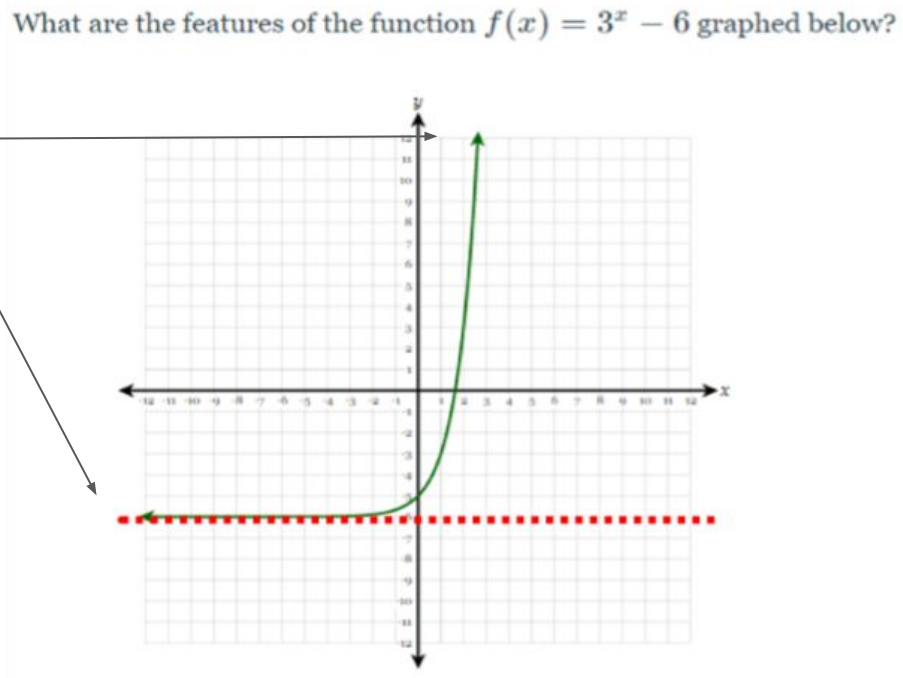
Describe the overall curve: if the right arrow is point up it is an INCREASING (GROWTH) model. If it is going down it is DECREASING (DECAY) model.

Describe the left arrow:

As $x \to -\infty, f(x) \to -6$

Describe the right arrow:

As $x \to \infty, f(x) \to \infty$

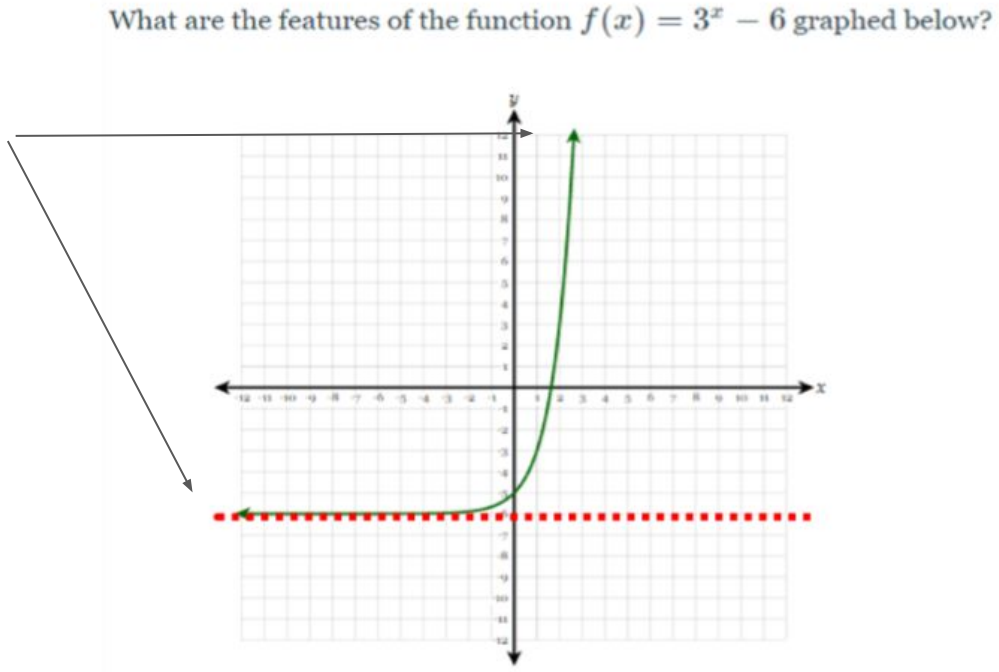


Features we are looking for:

DOMAIN: All the possible x-values of the equation
RANGE: All the possible y-values of the equation

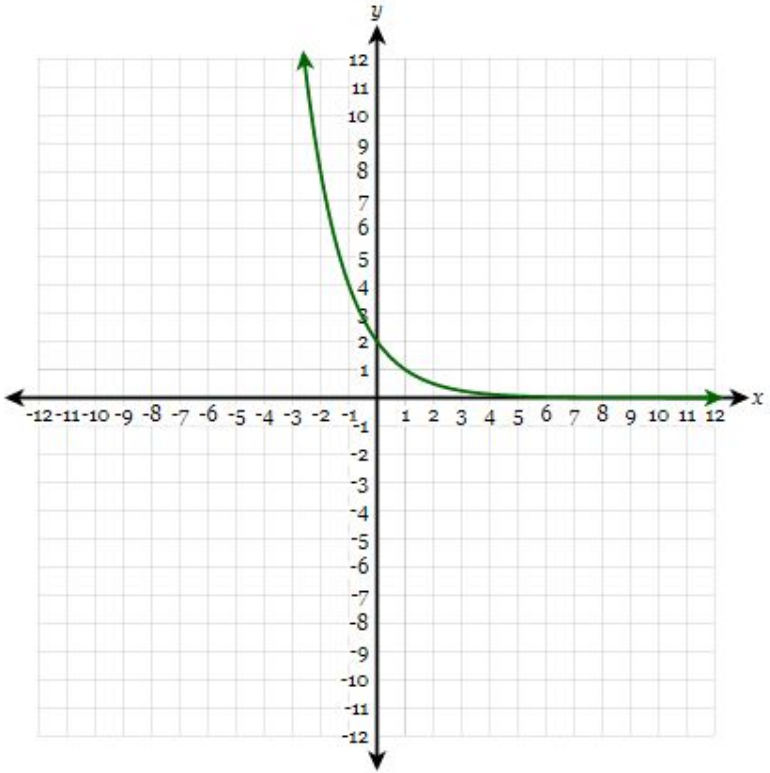
In an exponential equation the DOMAIN is usually all real numbers and is written (-∞,∞). In real world applications it may be limited. For instance, if x represents time the domain would be [0,∞)

RANGE is bounded by the asymptote: (-6,∞)



PRACTICE 1

What are the features of the function $f(x) = 2\left(\frac{1}{2}\right)^x$ graphed below?

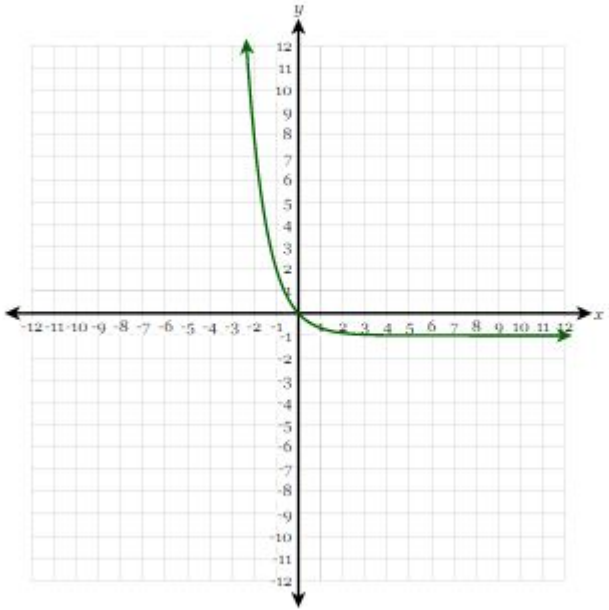


Answer the following questions about the graph to the left on your own paper:

1. Is the graph increasing or decreasing?
2. Write the equation of the asymptote
3. Describe the end behavior
4. What is the domain?
5. What is the range?

PRACTICE 2

What are the features of the function $f(x) = \left(\frac{1}{3}\right)^x - 1$ graphed below?

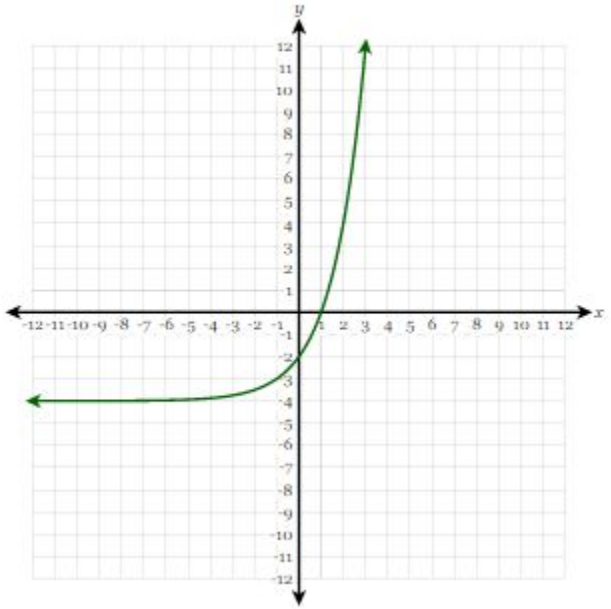


Answer the following questions about the graph to the left on your own paper:

1. Is the graph increasing or decreasing?
2. Write the equation of the asymptote
3. Describe the end behavior
4. What is the domain?
5. What is the range?

PRACTICE 3

What are the features of the function $f(x) = 2\,(2)^x - 4$ graphed below?



Answer the following questions about the graph to the left on your own paper:

1. Is the graph increasing or decreasing?

2. Write the equation of the asymptote

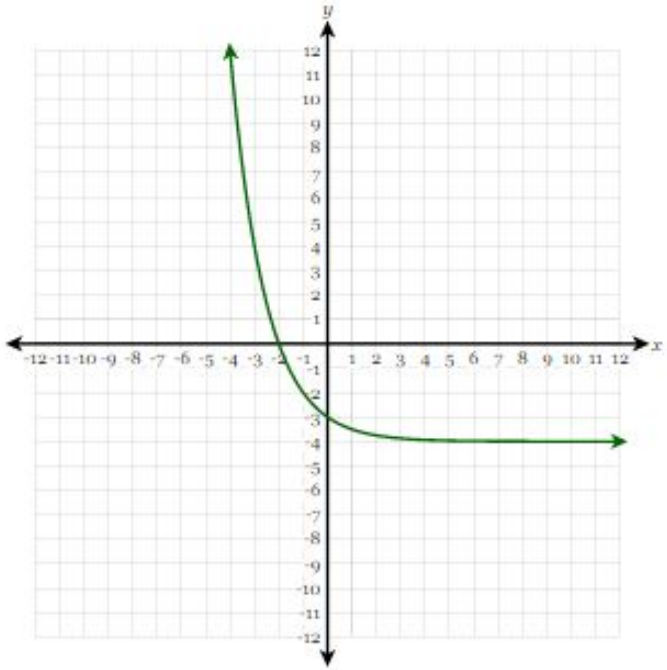
3. Describe the end behavior

4. What is the domain?

5. What is the range?

PRACTICE 4

What are the features of the function $f(x) = \left(\frac{1}{2}\right)^x - 4$ graphed below?



Answer the following questions about the graph to the left on your own paper:

1. Is the graph increasing or decreasing?

2. Write the equation of the asymptote

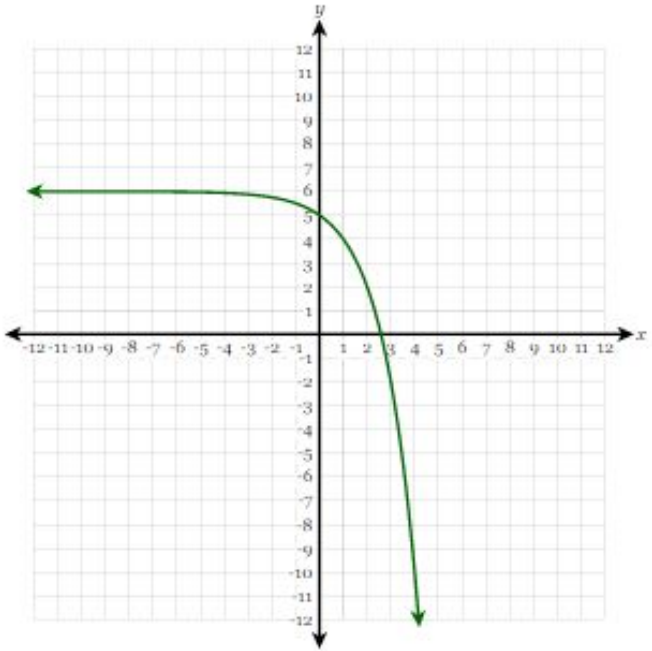
3. Describe the end behavior

4. What is the domain?

5. What is the range?

PRACTICE 5

What are the features of the function $f(x) = -2^x + 6$ graphed below?



Answer the following questions about the graph to the left on your own paper:

1. Is the graph increasing or decreasing?

2. Write the equation of the asymptote

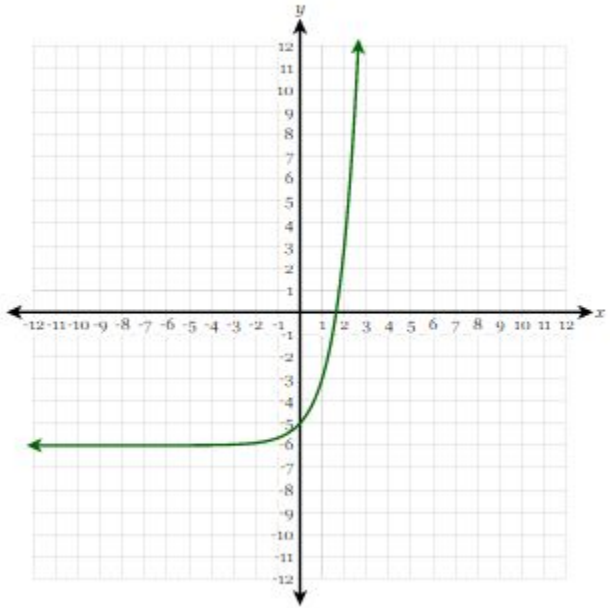
3. Describe the end behavior

4. What is the domain?

5. What is the range?

PRACTICE 6

What are the features of the function $f(x) = 3^x - 6$ graphed below?



Answer the following questions about the graph to the left on your own paper:

1. Is the graph increasing or decreasing?

2. Write the equation of the asymptote

3. Describe the end behavior

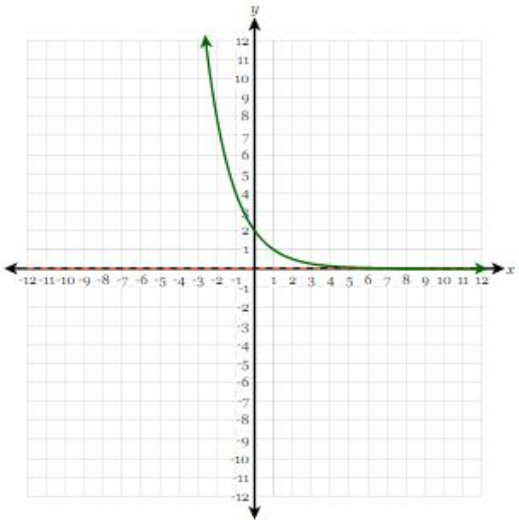
4. What is the domain?

5. What is the range?

Answers 1 and 2

What are the features of the function $f(x) = 2\left(\frac{1}{2}\right)^x$ graphed below?

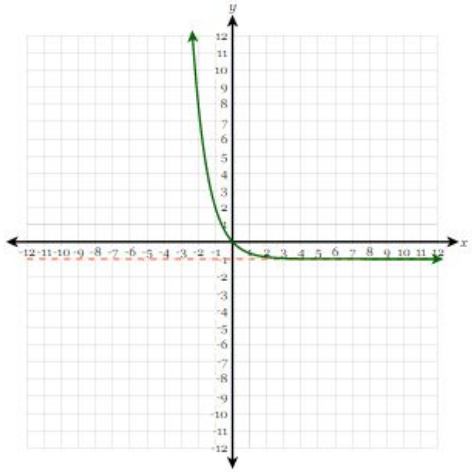
Horizontal asymptote at $y = 0$



The function $f(x)$ is an exponential function with a horizontal asymptote of $y = 0$. The range of the function is $(0, \infty)$, and it is decreasing on its domain of $(-\infty, \infty)$. The end behavior on the LEFT side is as $x \to -\infty$, $y \to \infty$, and the end behavior on the RIGHT side is as $x \to \infty$, $y \to 0$.

What are the features of the function $f(x) = \left(\frac{1}{3}\right)^x - 1$ graphed below?

Horizontal asymptote at $y = -1$

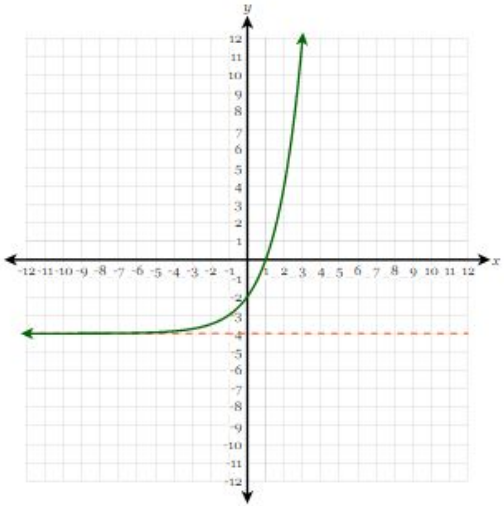


The function $f(x)$ is an exponential function with a horizontal asymptote of $y = -1$. The range of the function is $(-1, \infty)$, and it is decreasing on its domain of $(-\infty, \infty)$. The end behavior on the LEFT side is as $x \to -\infty$, $y \to \infty$, and the end behavior on the RIGHT side is as $x \to \infty$, $y \to -1$.

Answers 3 and 4

What are the features of the function $f(x) = 2\,(2)^x - 4$ graphed below?

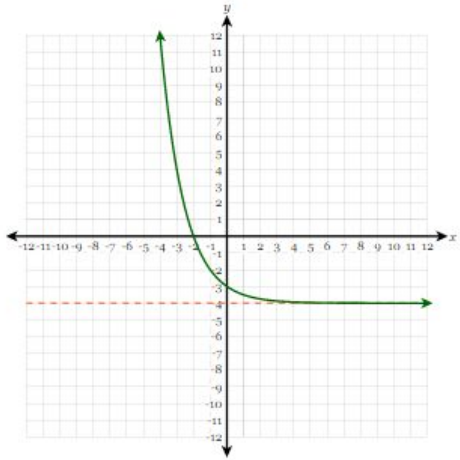
Horizontal asymptote at $y = -4$



The function $f(x)$ is an exponential function with a horizontal asymptote of y = -4. The range of the function is (-4, ∞), and it is increasing on its domain of (-∞, ∞). The end behavior on the LEFT side is as x → -∞, y → -4, and the end behavior on the RIGHT side is as x → ∞, y → ∞.

What are the features of the function $f(x) = \left(\frac{1}{2}\right)^x - 4$ graphed below?

Horizontal asymptote at $y = -4$



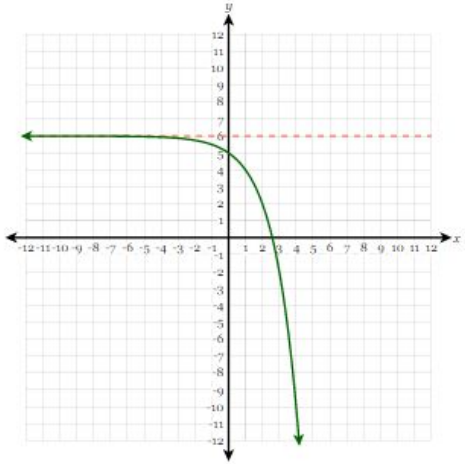
The function $f(x)$ is an exponential function with a horizontal asymptote of y = -4. The range of the function is (-4, ∞), and it is decreasing on its domain of (-∞, ∞). The end behavior on the LEFT side is as x → -∞, y → ∞, and the end behavior on the RIGHT side is as x → ∞, y → -4.

Answers 5 and 6

Problems taken from Deltamath.com: features of exponential and log functions

What are the features of the function $f(x) = -2^x + 6$ graphed below?

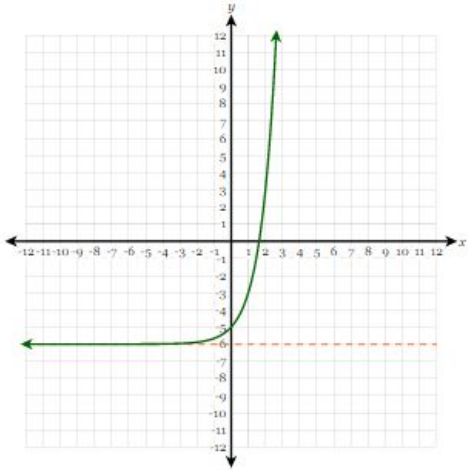
Horizontal asymptote at $y = 6$



The function $f(x)$ is an exponential function with a horizontal asymptote of y = 6. The range of the function is (-∞, 6), and it is decreasing on its domain of (-∞, ∞). The end behavior on the LEFT side is as x → -∞, y → 6, and the end behavior on the RIGHT side is as x → ∞, y → -∞.

What are the features of the function $f(x) = 3^x - 6$ graphed below?

Horizontal asymptote at $y = -6$



The function $f(x)$ is an exponential function with a horizontal asymptote of y = -6. The range of the function is (-6, ∞), and it is increasing on its domain of (-∞, ∞). The end behavior on the LEFT side is as x → -∞, y → -6, and the end behavior on the RIGHT side is as x → ∞, y → ∞.