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Study Guide and Intervention

Transforming and Analyzing Exponential Functions

Example **Describe the transformation.**

What transformations of the exponential parent function, *f(x)* = b^x will result in the graph of the exponential function *g(x)* = $-3(10)^{2x-1} + 5$?

Solution

Step 1 **Rewrite the equation of g(x) in general form to determine the values of the parameters a, b, c, and d.**

$g(x) = a(b)^{kx-c} + d$,

$g(x) = -3(10)^{2x-1} + 5$

Therefore, a = -3, b = 10, k = 2, c = 1, and d = 5

Step 2 **Use the values of the parameters to describe the transformations of the exponential parent function f(x) that are necessary to produce g(x).**

a = -3, so |a| > 1; vertically stretched by a factor of 3

since a < 0, the graph will be reflected across the x-axis

b = 10, so b > 1; this will be a growth function

k = 2, so k > 1; horizontally compressed by a factor of $\frac{1}{2}$

c = 1, so c > 0. translate $\frac{1}{2}$ units to the right

d = 5; translate 5 units up

Exercises

For questions 1-4, describe the transformation of the exponential parent function, f(x) = b^x that will result in the graph of the exponential function given.

1. $f(x) = 1.5^x$

2. $f(x) = 9^x$

3. $f(x) = \frac{3}{4}(2)^x + 1$

4. $f(x) = 2^{0.5x+3}$

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Study Guide and Intervention

Transforming and Analyzing Exponential Functions (cont.)

Example **Identify the domain, range, asymptote, x-intercept and y-intercept of the exponential function described by the equation shown below. Write the domain and range in set builder notation.**

$$y = -(2)^{1.5x-3} + 1$$

Solution

Step 1 **Determine the domain and range of f(x).**

Since this is an exponential function, the domain is *all real numbers*.

The range is dependent on a and d. Since d = 1, the graph is translated 1 unit up; a is negative, so the graph is reflected over the x-axis. Therefore, the values will be less than 1.

Set builder notation

Domain: $\{x|x \in \mathbb{R}\}$ Range: $\{y|\ y< 1\}$

Step 2 **Determine the asymptote.**

asymptote: $y = d = 1$

Step 3 **Determine the x-intercept of f(x).**

Use your calculator to find the x-intercepts

x-intercept: (2, 0)

Step 4 **Determine the y-intercept of f(x).**

Use your calculator to find the y-intercepts

y-intercept: (0, .875)

Exercises

For questions 5-10, identify the domain, range, asymptote, x-intercept and y-intercept of the exponential function. Write the domain and range in set builder notation.

5. $f(x) = 15(\frac{1}{2})^x - 4$

6. $f(x) = 6(1.5)^{2x}$

7. $f(x) = 5(\frac{1}{2})^x - 4$

8. $f(x) = -4(2)^x$

9. $f(x) = -(2)^x - 5$

10. $f(x) = 6(\frac{1}{2})^x + 1$