

Day 3 – Transformations of Exponential Functions

Transformations of exponential functions is very similar to transformations with quadratic functions. Do you remember what a, h, and k do to the quadratic function?

A: _____ H: _____ K: _____

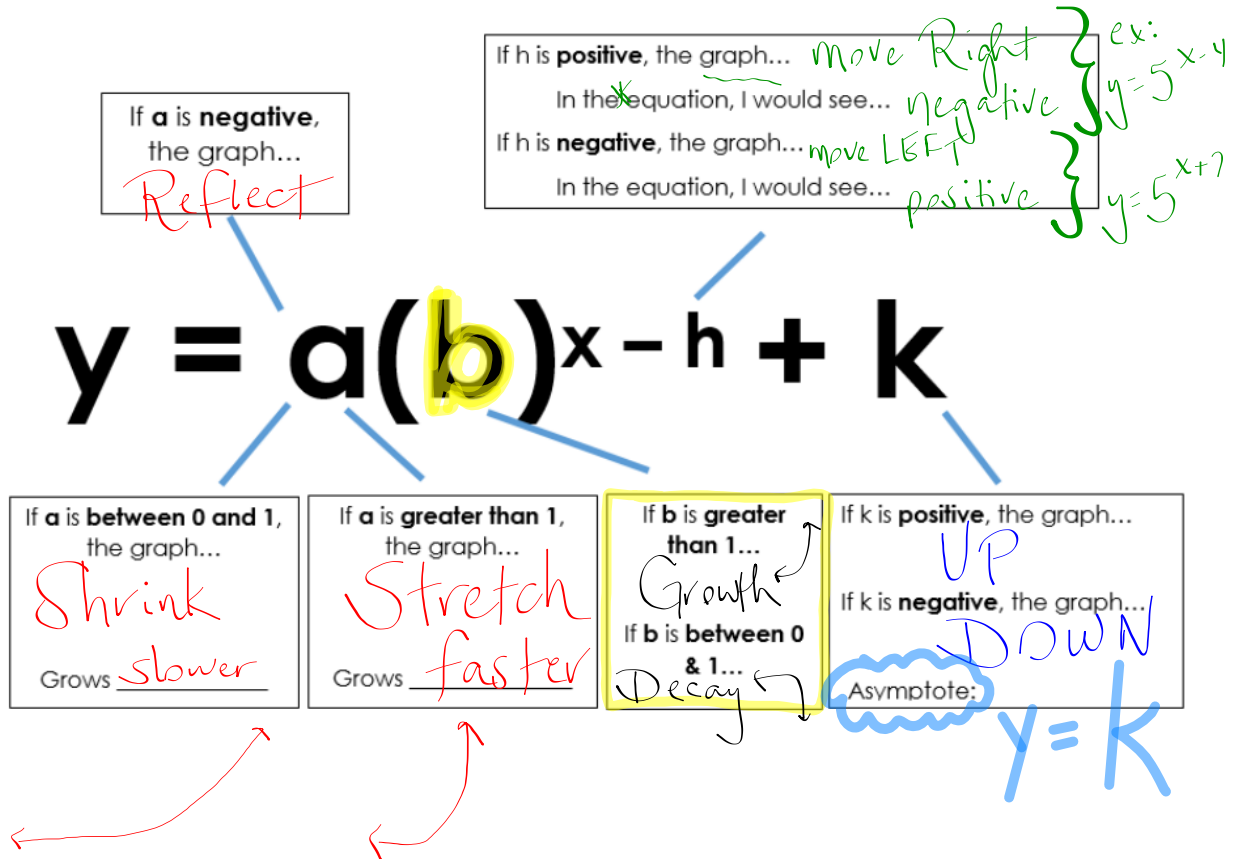
Summary of Exponential Transformations

The general form of an exponential function is:

$$f(x) = a(b)^{x-h} + k.$$

*When your graph is shifted vertically, the y-intercept becomes a + k.

*When the graph is shifted vertically, the asymptote becomes y = k.



Practice Identifying Transformations

Example: Describe the transformations from the parent function to the transformed function.

A. $f(x) = 3^x \rightarrow f(x) = 3^{x+3}$

* Left 3

B. $y = 5^x \rightarrow y = \frac{1}{2}(5)^x - 4$

shrink by $\frac{1}{2}$
Down 4

C. $y = (0.4)^x \rightarrow y = -3(0.4)^x + 8$

Reflect
Stretch by 3
Up 8

D. $f(x) = 4^x \rightarrow f(x) = 4^{x-6} + 5$

E. $f(x) \rightarrow f(x) + 5$

F. $g(x) \rightarrow g(x + 1)$

G. $f(x) = 3^x \rightarrow f(x) = \frac{3}{4}(3)^{x-2}$

shrink by $\frac{3}{4}$
Right 2

H. $y = 5^x \rightarrow y = -\frac{1}{2}(5)^{x+2}$

I. $y = 0.4^x \rightarrow y = 2(0.4)^{x-6}$

J. $f(x) \rightarrow f(x - 4)$

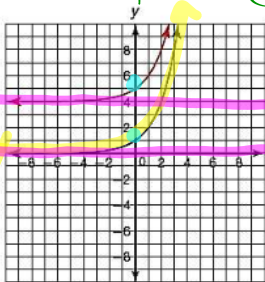
K. $h(x) \rightarrow 2h(x - 3) - 7$

L. $g(x) \rightarrow -g(x + 2) + 1$

Example: Using the graphs of $f(x)$ and $g(x)$, describe the transformations from $f(x)$ to $g(x)$:

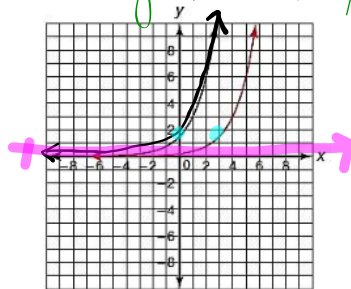
A.

Up 4 (k)



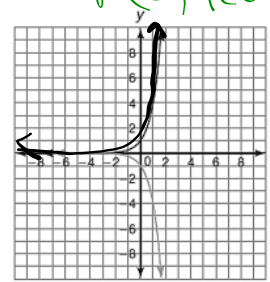
B.

Right 3 (h)



C.

Reflect (-a)



Example: Using the function $g(x) = 5^x$, create a new function $h(x)$ given the following transformations:

A. up 4 units

$g(x) = 5^{x+4}$

B. left 2 units

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

C. down 7 units and right 3 units

$g(x) = 5^{x-3} - 7$

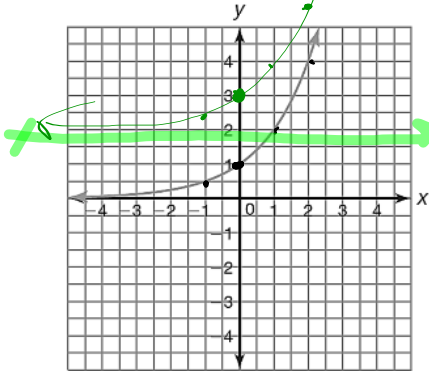
D. stretch by 3

E. reflect over x-axis and left 3

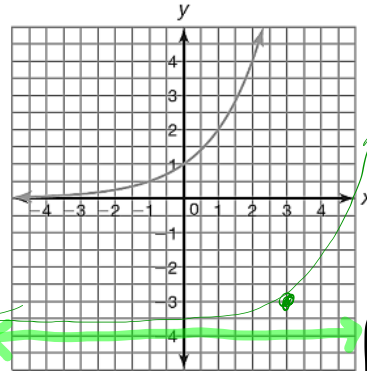
F. Shrink by $\frac{1}{2}$ and reflect over x-axis

$g(x) = -\frac{1}{2}(5)^x$

Example: Using the graph that is given, $y = 2^x$, graph a new function with the stated transformations.
 a. shifted up two units
 b. shifted down 4 units and right 3 units



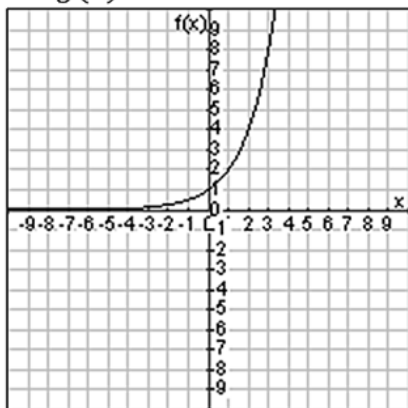
Equation:
 $y = 2^x + 2$
 Y-intercept:
 $(0, 3)$
 Asymptote:
 $y = 2$



Equation:
 $y = 2^{x-3} - 4$
 Y-intercept:
 $y = 2^{0-3} - 4$
 $y = 2^{-3} - 4$
 Asymptote:
 $y = -4$
 $(0, -3.875)$

Example: Your parent functions will be $f(x) = 2^x$. A new function, $g(x)$ is given. Describe the transformations you see in $g(x)$ and then sketch the graph of $g(x)$.

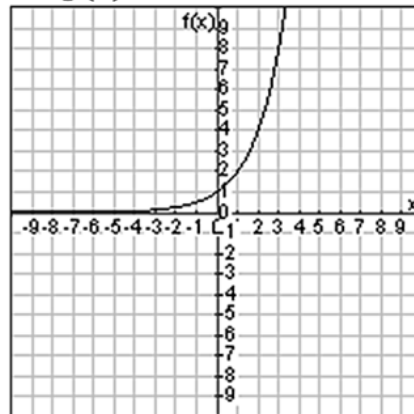
19. $g(x) = 2^x + 4$



Y-intercept:

Asymptote:

20. $g(x) = 2^{x+4}$



Y-intercept:

Asymptote:

Algebra 1

Unit 10: Exponential Functions

Notes

Example: Find the y-intercept and asymptote of the following equations:

A. $f(x) = 3^x \rightarrow f(x) = 3^{x+3}$

y-intercept:

$(0, ?)$

asymptote:

$y = 0$

3^{0+3}
 $(0, 27)$

B. $y = \frac{1}{2}(5)^x \rightarrow y = \frac{1}{2}(5)^x - 4$

y-intercept:

$\frac{1}{2}(5)^0 - 4$ $(0, -3.5)$

asymptote:

$y = -4$

C. $y = 3(0.4)^x \rightarrow y = 3(0.4)^x + 8$

y-intercept:

asymptote:

D. $f(x) = 4^x \rightarrow f(x) = 4^{x-6} + 5$

y-intercept:

asymptote:

$$d: -7\left(\frac{1}{3}\right)^x + 2$$

T
 Reflect
 Stretch?
 Up 2

~~*~~ Y-int
 $(0, ?)$
 $(0, -5)$

Asymp
 $Y = 2$

G/D
 decay
 $(1/3)$

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