

# Unit 4 → Part 2

## GUIDED NOTES – Lesson 6-1b

### Translations of Exponential Functions

The equation  $f(x) = (a)b^{x-h} + k$  is the translation function that helps us understand how changing values impacts the resulting graph.

**h** tells us about horizontal movement.

If **h** is positive...

If **h** is negative...

**a** tells us about stretching, reflecting, and compressing.

If **a** < 0...

If **a** > 1...

If  $0 < a < 1$ ...

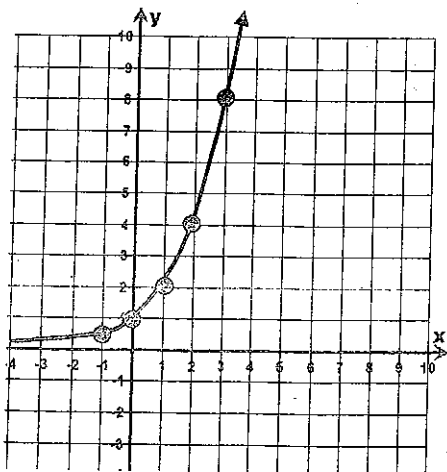
**k** tells us about vertical movement.

If **k** is positive...

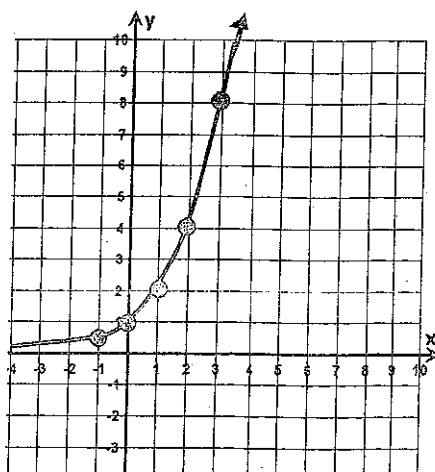
If **k** is negative...

Given the graphed parent function  $f(x) = 2^x$ , perform the following translations.

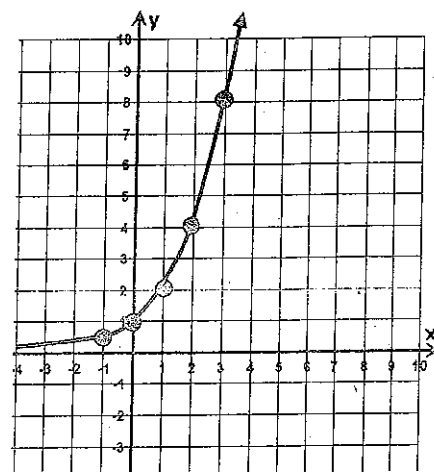
$$f(x) = 2^{x-2}$$



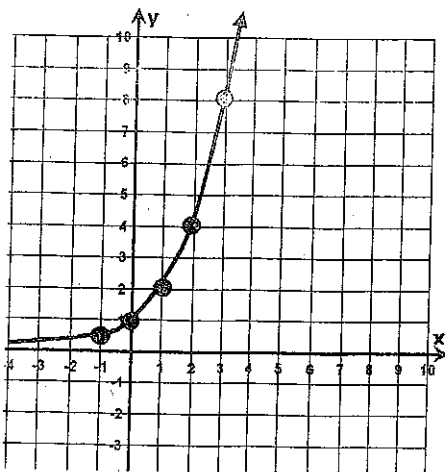
$$f(x) = 2^x - 2$$



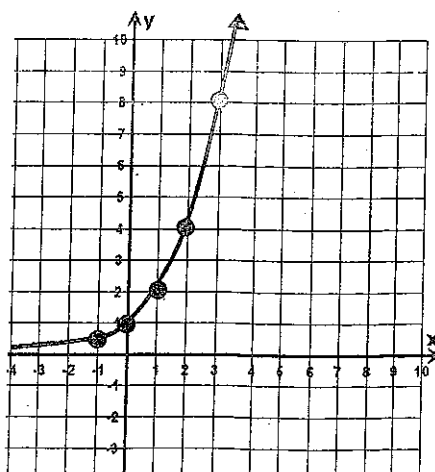
$$f(x) = (-1)2^x$$



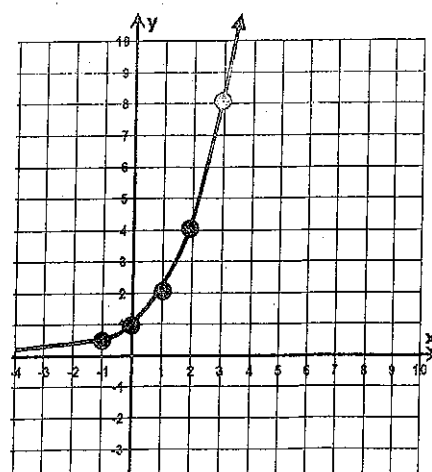
$$f(x) = 2^{x+2}$$



$$f(x) = 2^x + 3$$



$$f(x) = (-2)2^x$$



## Exponential Transformations Worksheet

1) Describe the transformations that map the function  $y = 2^x$  onto each of the following functions...

a)  $y = 2^x - 2$

b)  $y = 2^{x+3}$

c)  $y = 4^x$

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

2) Create a sketch of each graph for each equation in question 1. (a table of values may help)

**SKIP**

3) Write the equation for the function that results from each transformation applied to the base function  $y = 5^x$ .

a) translate down 3 units

b) shift right 2 units

c) translate left  $\frac{1}{2}$  unit

d) shift up 1 unit and left 2.5 units

4) Write the equation for the function that results from each transformation applied to the base function

$$f(x) = \left(\frac{1}{3}\right)^x$$

a) reflect in the x-axis (vertical reflection)

b) stretch vertically by a factor of 3

c) stretch horizontally by a factor of 2.4

d) reflect horizontally, stretch vertically by factor of 4

**SKIP**

**SKIP**

**5) Just list transformations**

5) ~~Quickly sketch~~ the following exponential functions by transforming the key points and/or asymptote.

a)  $y = 3^{x-3} + 2$

b)  $y = -\left(\frac{1}{2}\right)^x$

c)  $y = \frac{1}{2}(2^x) - 3$

d)  $y = \left(\frac{1}{3}\right)^{-2x}$