Chapter 7: EXPONENTIAL FUNCTIONS
7.2 – Transformations of Exponential Functions

Horizontal stretch by a factor of "$1/b$"

Vertical stretch by a factor of "a"

$$y = a \cdot c^{b(x-h)} + k$$ → Vertical shift up/down

Base of function

Horizontal shift left/right
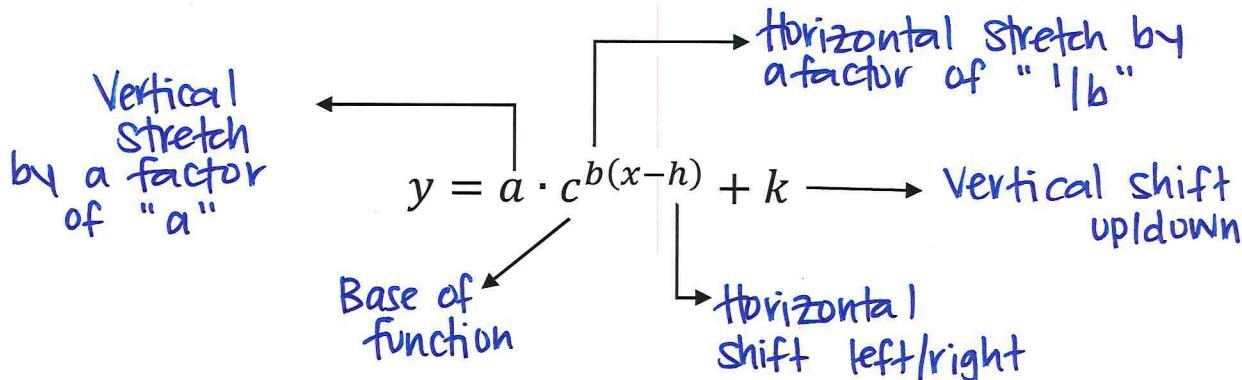
↳ Must draw and label asymptote.


Example #1

Sketch each of the following **exponential functions**.

a) $f(x) = 2^x + 1$

↳ Base function $y = 2^x$

↳ up one unit

(Asymptote moves up 1 unit)

$y = 1$

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

b) $y = -3^{x+1}$

↳ Base function $y = 3^x$

↳ Reflection over x-axis

↳ left one unit

(Asymptote not affected)

$y = 0$

$y = 3^{x+1}$

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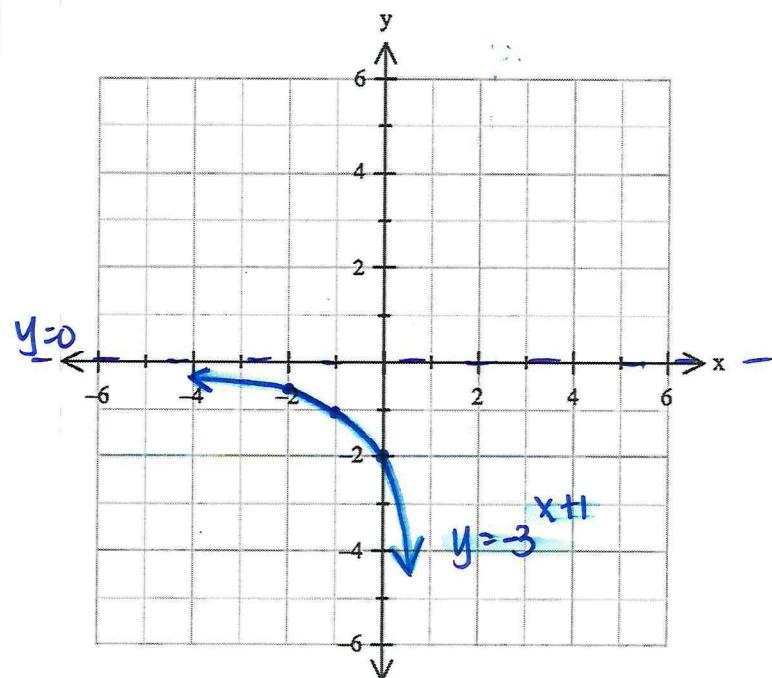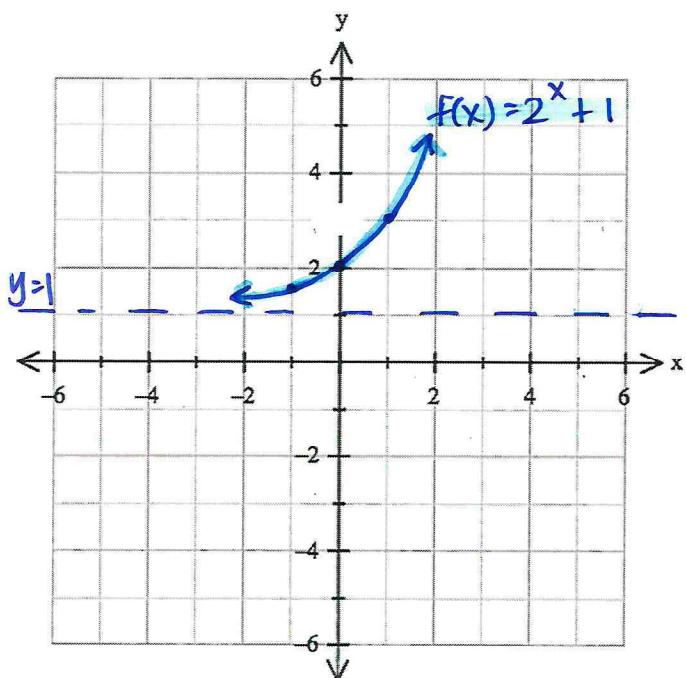
c) $g(x) = 4^{-x} - 1$
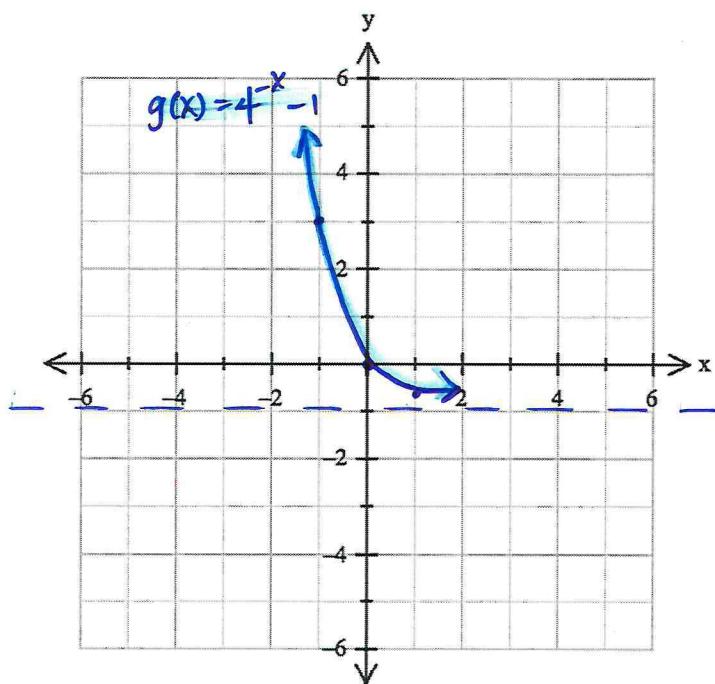
↳ Base function $y = 4$

↳ Reflection over y-axis

↳ Down one unit

(Asymptote moves down 1 unit)

d) $y = 3^{\frac{1}{2}x}$
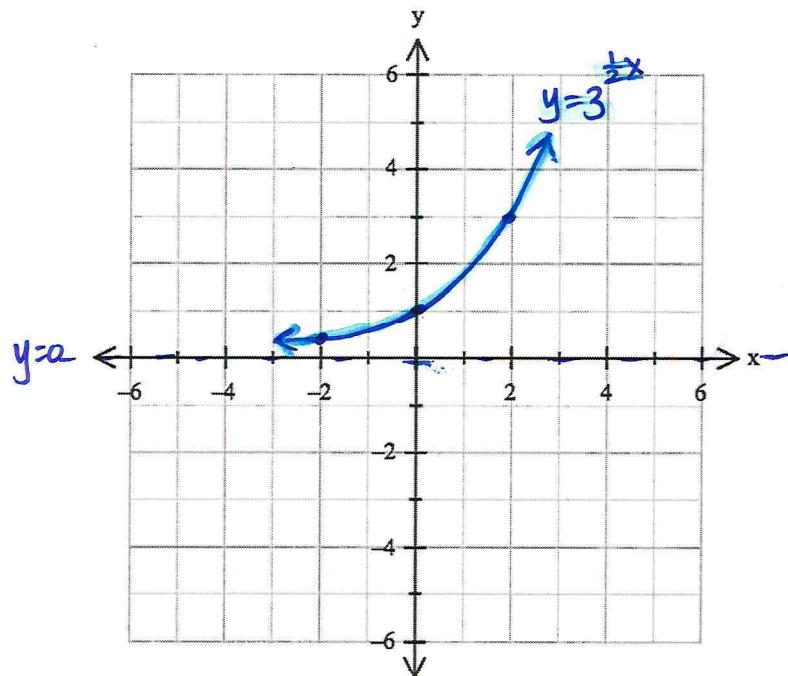
↳ Base function $y = 3$

↳ Horizontal stretch by a factor of 2

(Asymptote does not move)

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Example #2

a h k
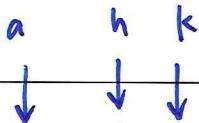
a) **Sketch** the graph of $y = 2(3)^{x-1} - 4$

↳ Base function $y = 3^x$

↳ Vertical Stretch by a factor of 2

↳ Right 1 unit

↳ Down 4 units

(Asymptote moves down 4)

$y = 2(3)^{x-1} - 4$

$y = -4$
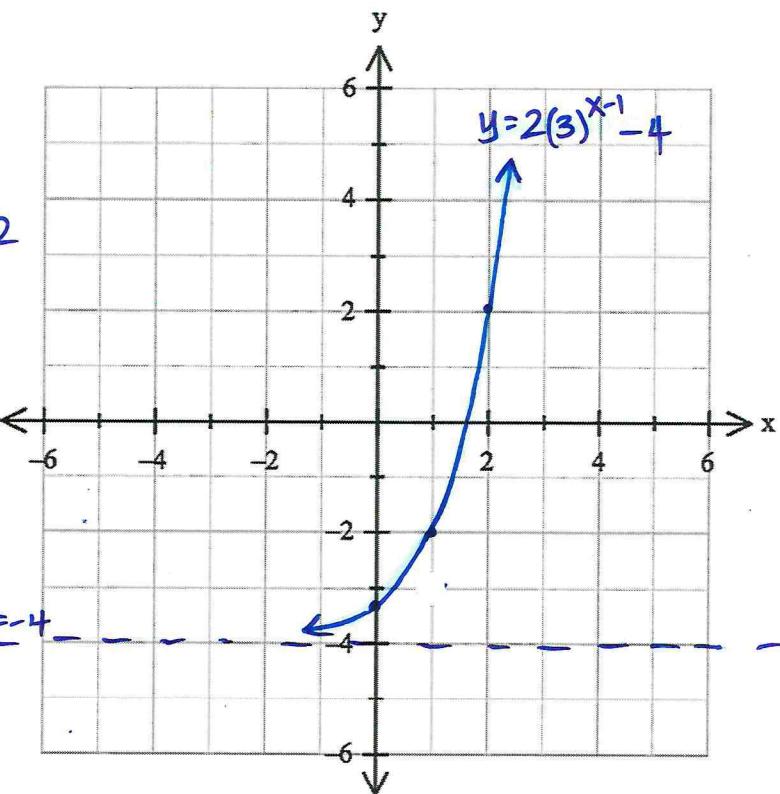
b) Write the equation of the **asymptote**.

↳ Horizontal Asymptote @ $y = -4$

Note: The '2' is a constant and doubles all of the y values.

If $f(x) = (3)^x$ is the original function, then $y = 2f(x-1) - 4$ would be the equation of this function.