Transformations of Logarithmic Functions

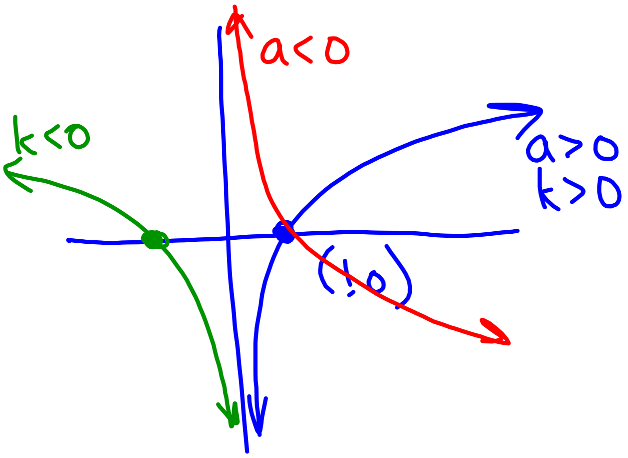
Nov. 28/2014

In general: $y = af[k(x-p)] + q$

For the logarithmic function, $y = \log_b x$, this becomes:

$$y = a\log_b[k(x-p)] + q$$

(note the base can be represented as 'b' to avoid confusion with the scale factor 'a')



$a > 1$

Transformation Strategies:

(1) Transform asymptote, x = 0, by horizontal shift p.

(2) Transform key points (1,0) and (b,1) using

$$(x, y) \rightarrow \left(\frac{x}{k} + p, ay \overset{?}{+} q\right)$$

Note: A third point may be required.

(3) The domain depends on the asymptote and any horizontal reflections.

$\log_b b = 1$

$\log_2 2 = y$

$2^y = 2^1$

$y = 1$

$\log_{10} 10 = y$

$10^y = 10^1$

$y = 1$

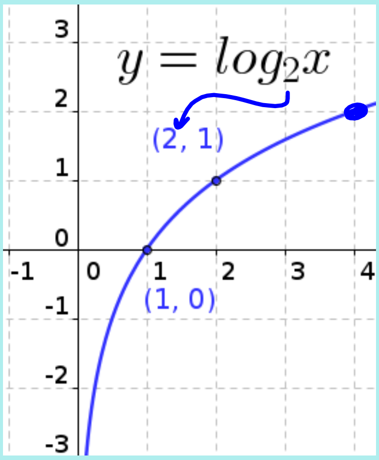
$\log_b(b^2) = \underline{2}$

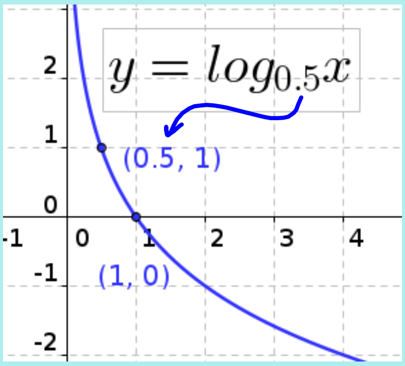
$\log_5(5^2) = y$

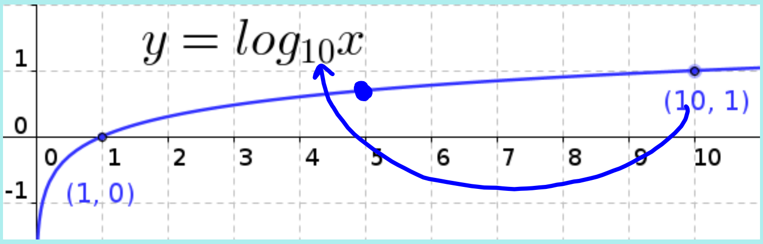
$5^y = 5^2$

$\log_b(b^{③}) = 3$

The parent logarithmic function $y = \log_b x$ will have convenient key points at $(1, 0)$ and $(b, 1)$







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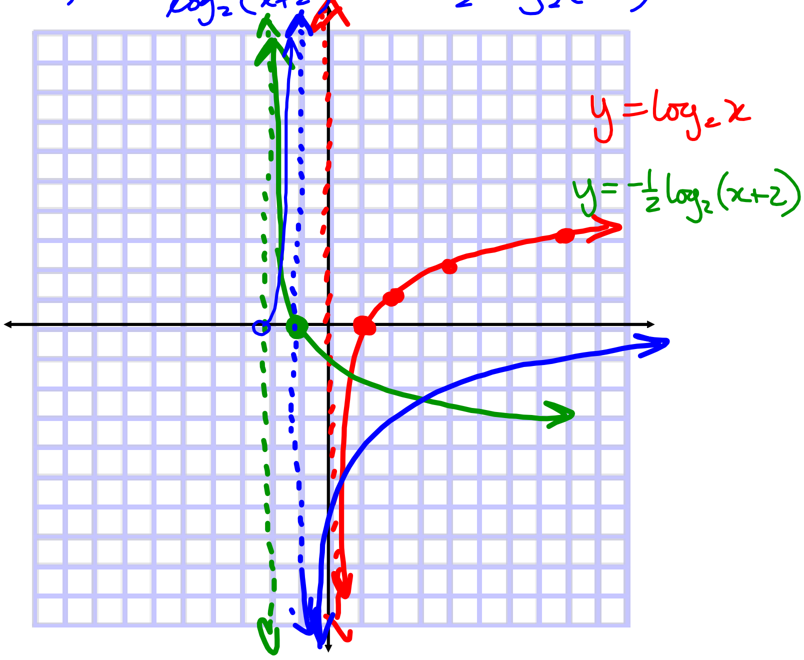
Assigned Work:

p.456 # 1 - 3, 4, 5, 8, 9, 11

$$11.\ f(x) = \frac{\overset{b}{-2}}{\log_2(x+2)} = \frac{\overset{1}{}}{-\frac{1}{2}\log_2(x+2)}$$



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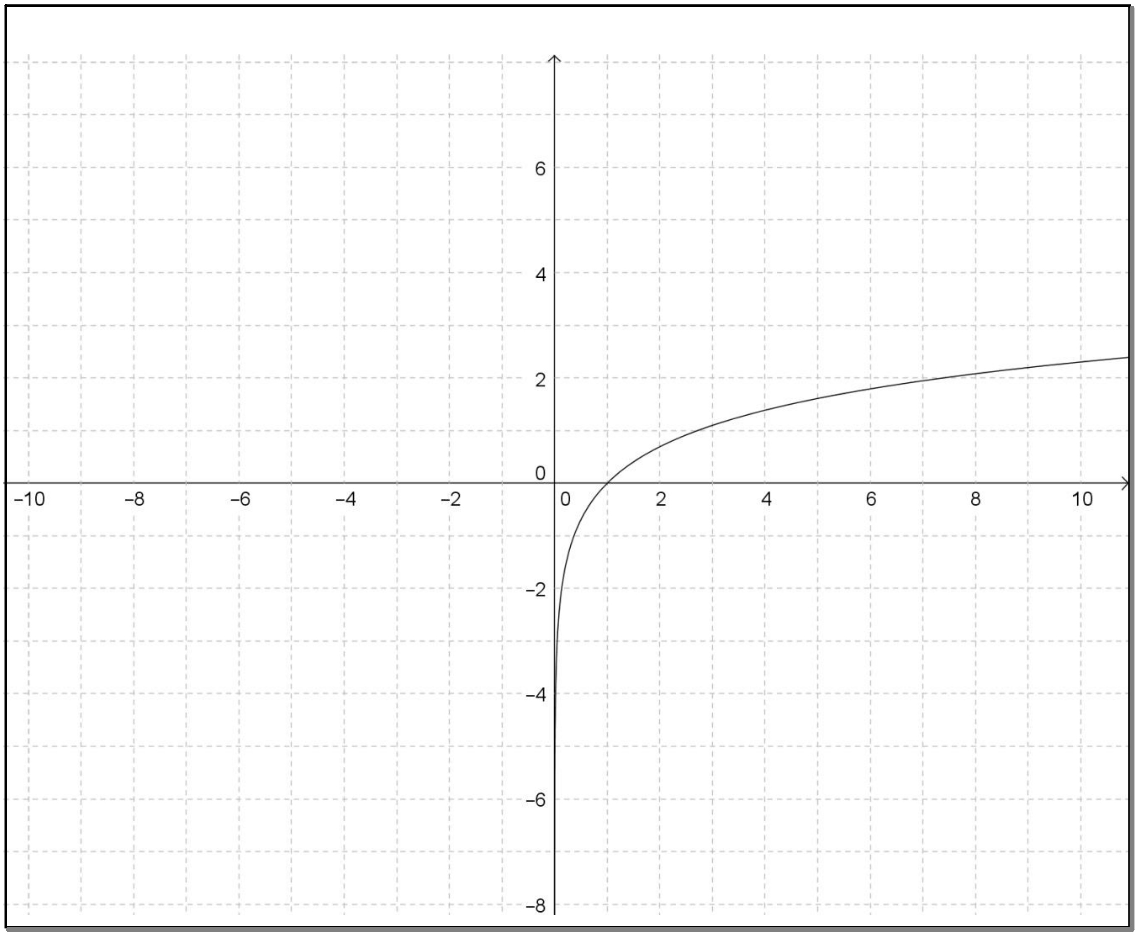

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