**Mark (/ 50):** _____ **NAME:** _____

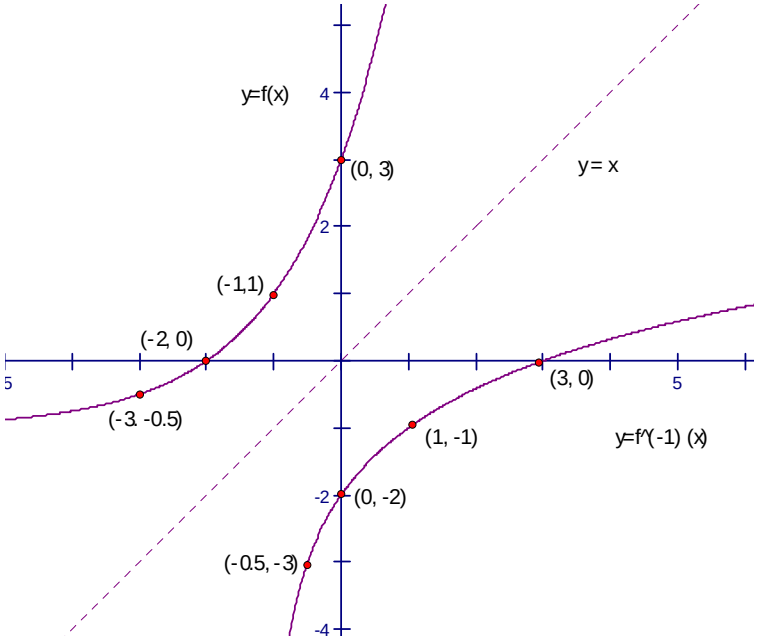
# Inverse Behaviour: Exponential and Logarithmic Functions

**Purpose:** The purpose of this assignment is to investigate the effects of "a", "g", and "h" on the logarithmic function.
**Method:** You will systematically draw the exponential curve, followed by the logarithmic partner to determine whether these values have the same or different effects.

**Directions:** For each of the following, graph the exponential function and the corresponding logarithmic function. Use carefully chosen points in your table of values. Draw your conclusions about the effects of "a", "g", and "h". Use the first example as a basis for your own work. ***Each question worth 10 marks.***

a) $y = 2^{x+2} - 1$ horizontal translation of 2 units left, vertical translation down 1unit

| x | y |
|---|---|
| -3 | -1/2 |
| -2 | 0 |
| -1 | 1 |
| 0 | 3 |
| 1 | 7 |
| 2 | 15 |




Inverse:

$x = 2^{y+2} - 1$

$x + 1 = 2^{y+2}$

$\log(x+1) = (y+2)\log 2$

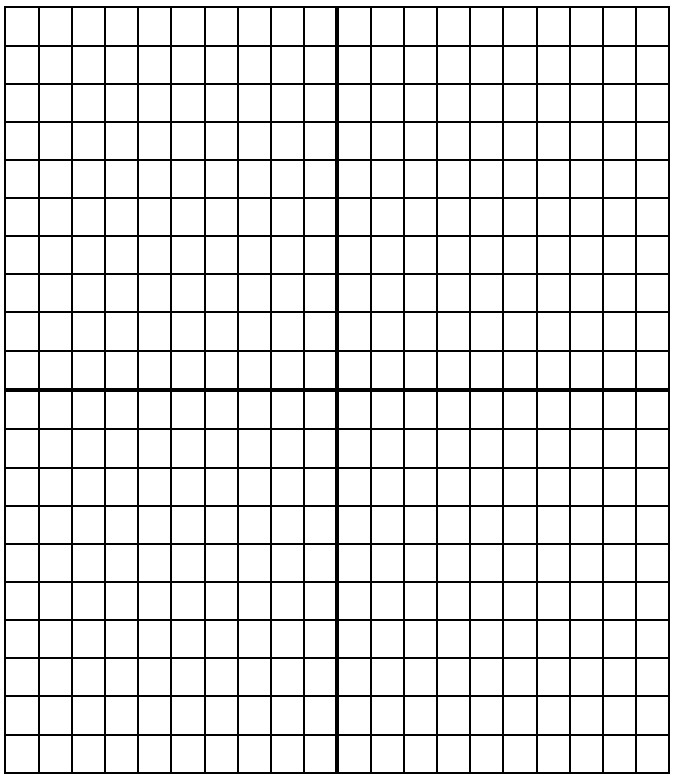
$\dfrac{\log(x+1)}{\log 2} = y + 2$

$\dfrac{\log(x+1)}{\log 2} - 2 = y$

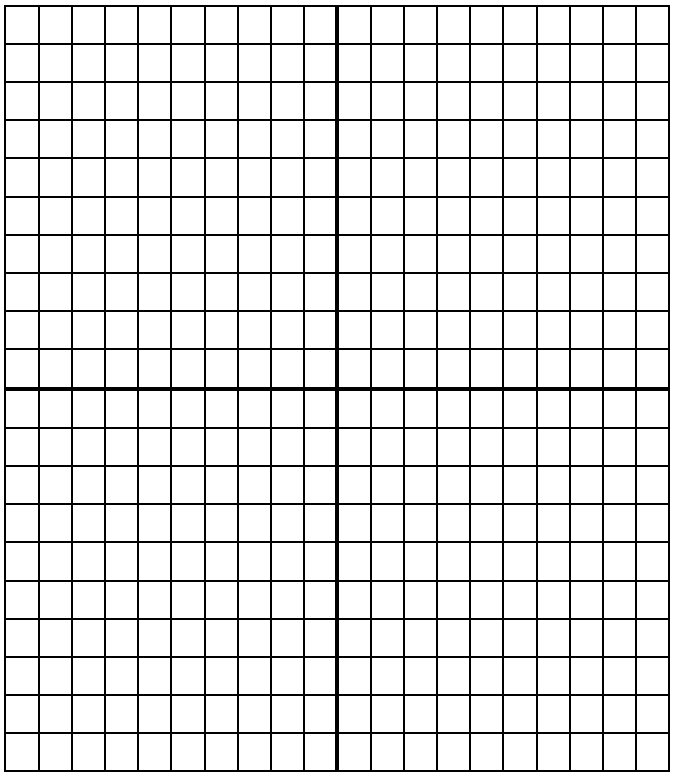
Therefore, $f^{-1}(x) = \dfrac{\log(x+1)}{\log 2} - 2$ *graph by reflecting original

***Comparison:*** *The important point of* $y = 2^x$ $(0,1)$, *becomes* $(-2,0)$ *in the transformed function* $y = 2^{x+2} - 1$ *and* $(0,-2)$ *in the inverse function. Therefore, the point* $(1,0)$ *from the inverse function is transformed by the* $(x+1)$ *horizontally left one unit, and the* $(-2)$ *refers to the vertical movement down 2 units.*

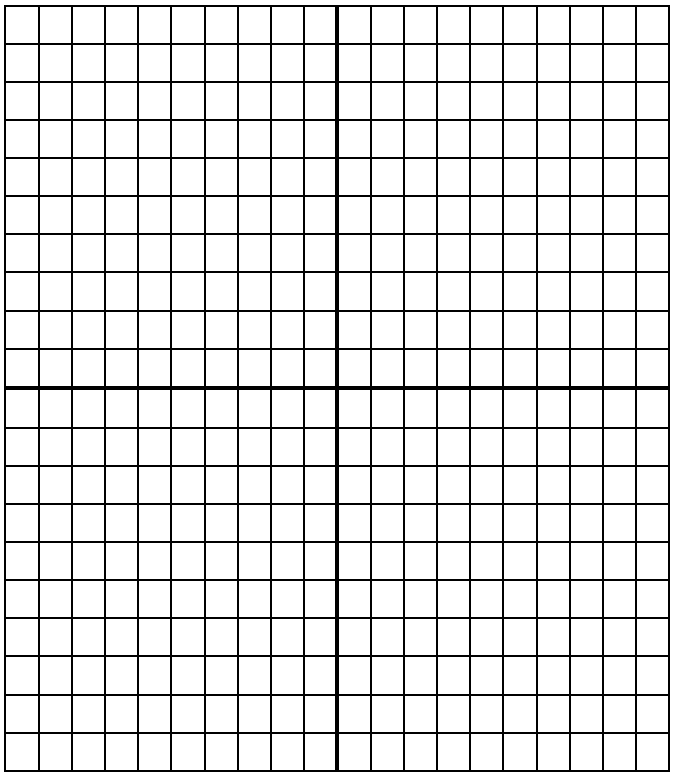
b) $y = \frac{1}{2} \bullet 2^{x-3} - 5$



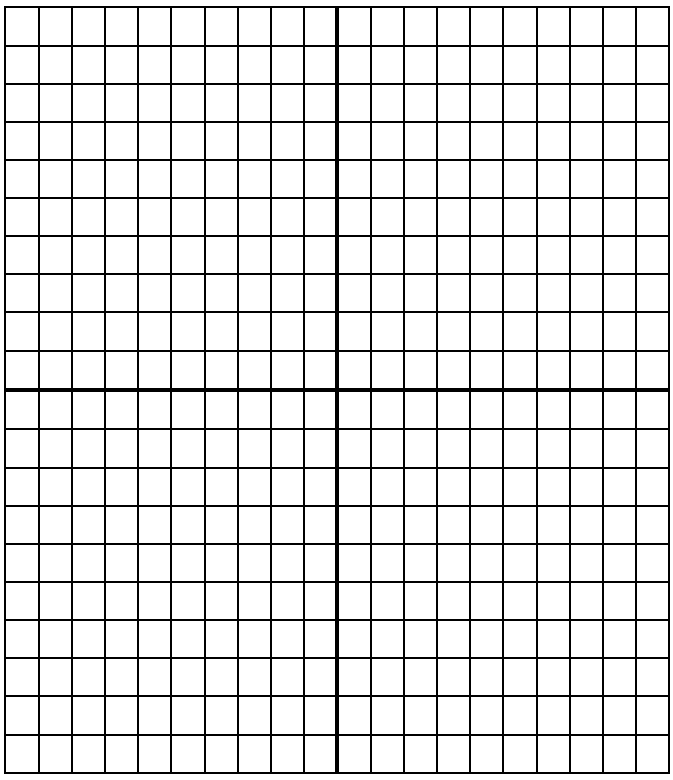
c) $y = -3\left(2^{x}\right) + 4$



d) $y = -3\left(2^{x+3}\right)+5$



e) $y = -\frac{1}{2} \cdot 2^{2(x-3)} + 4$



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