ESPERANCE SENIOR HIGH SCHOOL
Maths Methods year 12
EXTENDED PIECE OF WORK
LOGARITHMIC FUNCTIONS

NAME:_____ 60 minutes 38 marks

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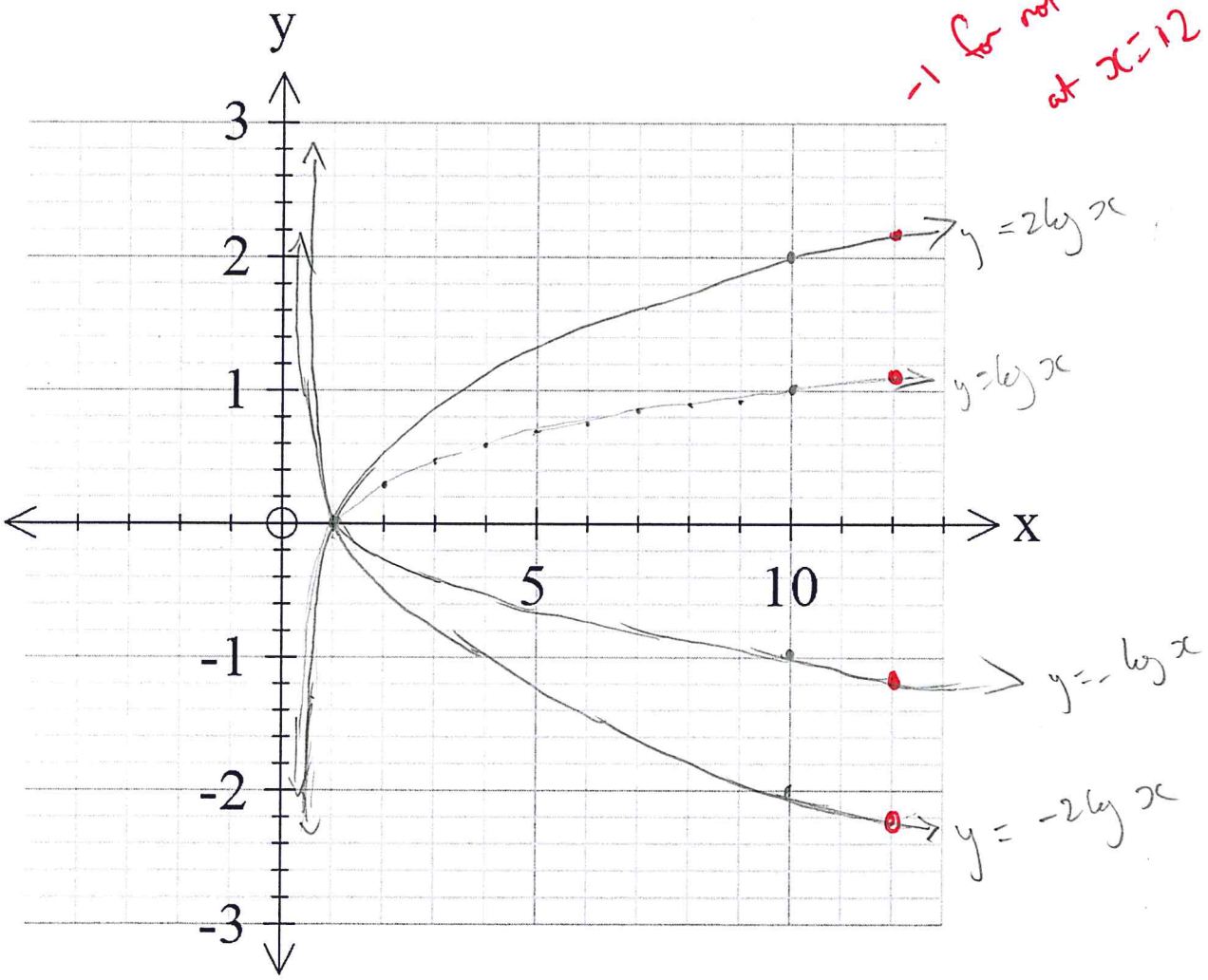
Complete the following investigation to find the effect of transformations on logarithmic functions.

1. (2, 6, 3 marks)

(a) On the axes below, sketch the graph of the function $y = \log x$ for $0 < x \leq 12$.

(b) On the same set of axes, investigate the graphs of $y = k \times \log x$ for the following **integer** values of k = -2, -1, 2. Clearly label each graph.

-1 for not finishing at x=12



(c) Write a short summary showing any information you have found that would help you identify graphs of the form $y = k \times \log x$

3 points but needs to discuss reflection

if k > 1 dilation from y-axis (appears bijection)

-1 ≤ k < 0 reflection about x-axis

if k < -1 reflection & dilation.

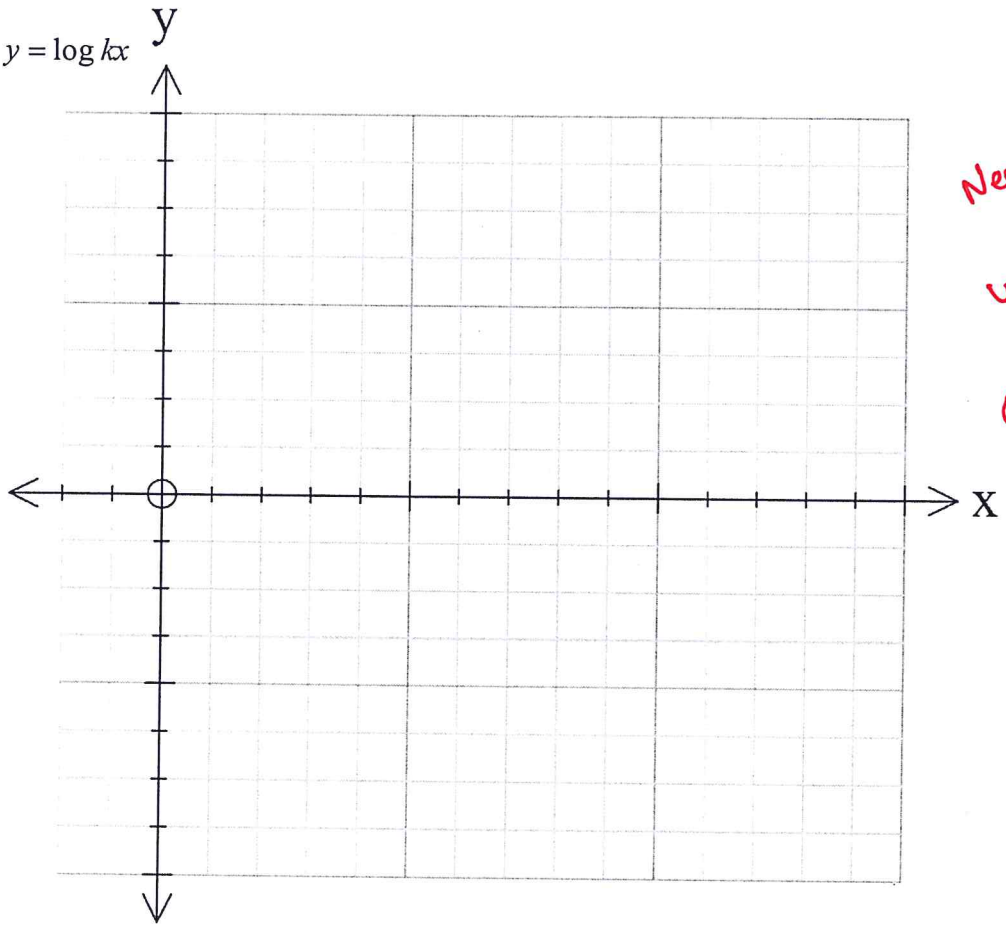
all intercept at (1, 0)

at x = 10, y = k

11

2. (3, 3, 3 marks)
In a similar manner, investigate the following functions for various integer values of k.

(a) $y = \log kx$



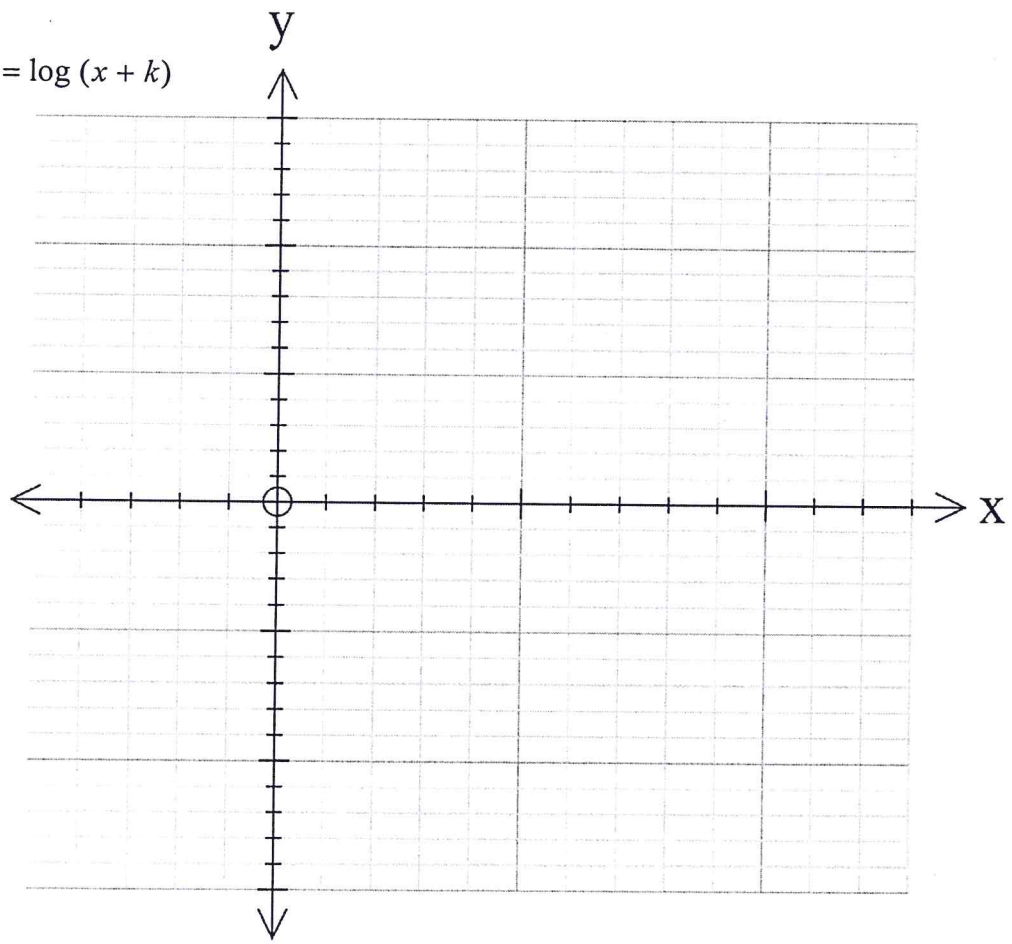
Need 3 different values of k for (a), (b) & (c)

Not k=1 for (a)

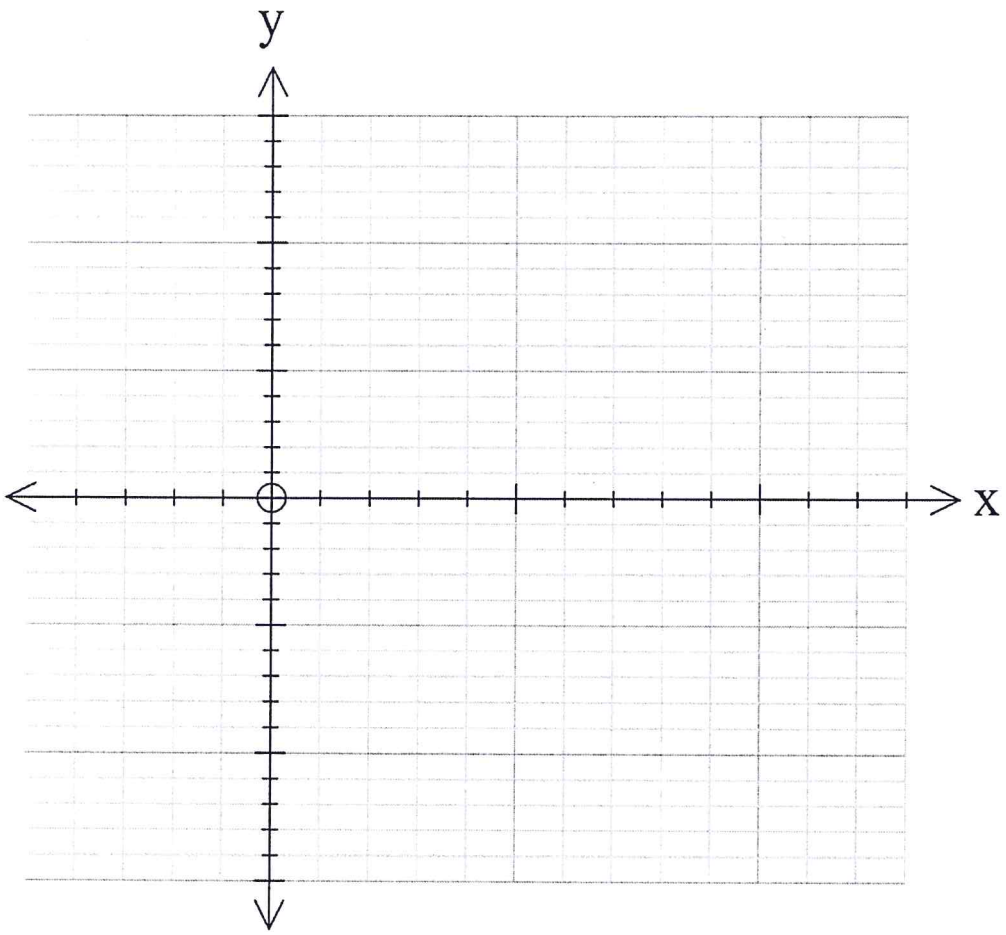
k=0 for (b)

or k=10 for (c)

(b) $y = \log (x + k)$



(c) $y = \log_k x$



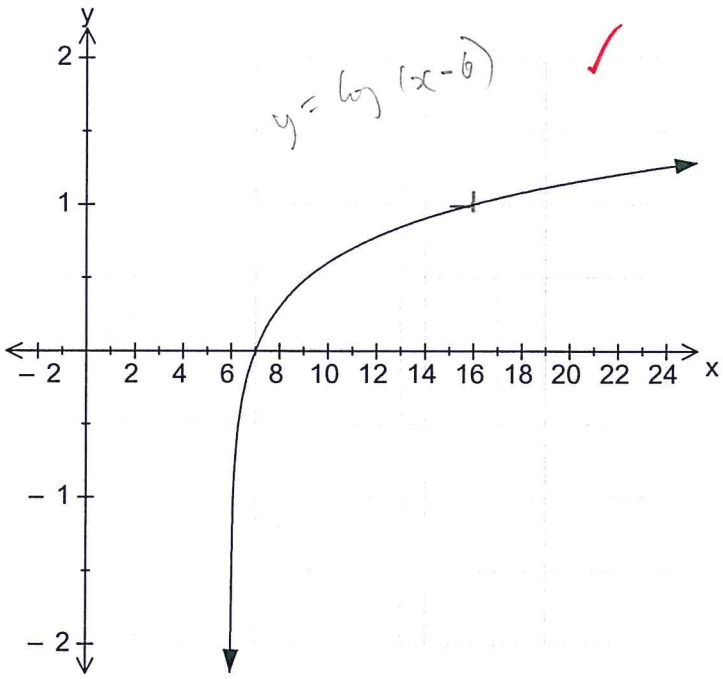
6

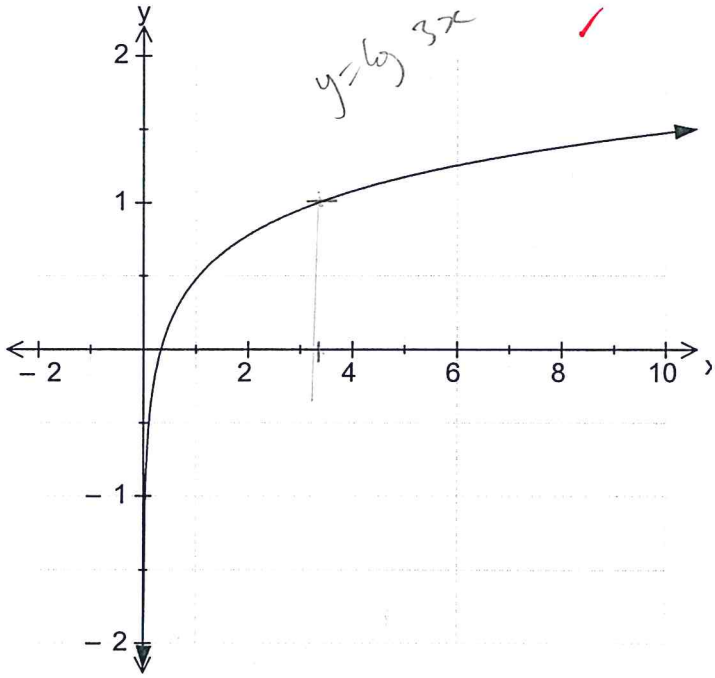
Use your investigations of the above functions to answer the following questions.

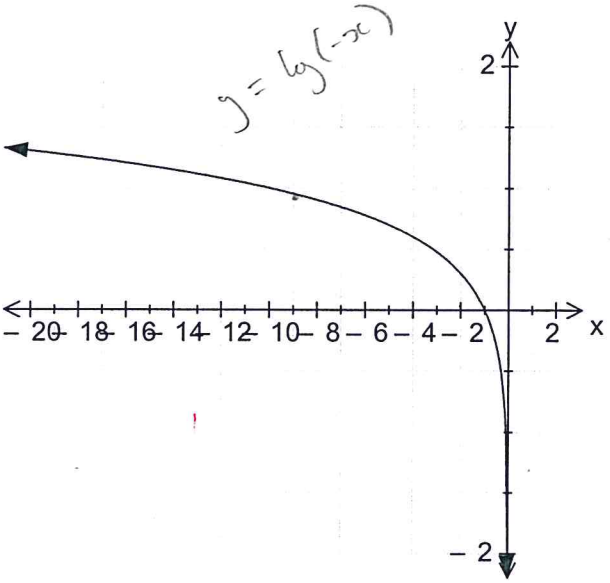
3. (8 marks)

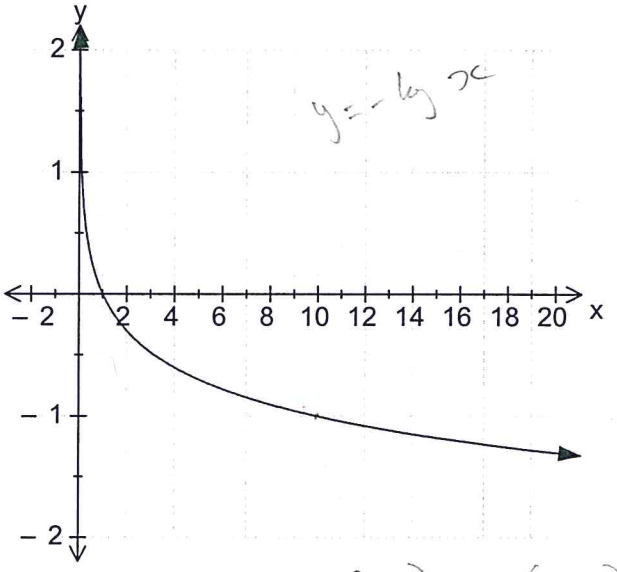
The following graphs are transformations of the graph $y = \log x$.

State the equation of each function.

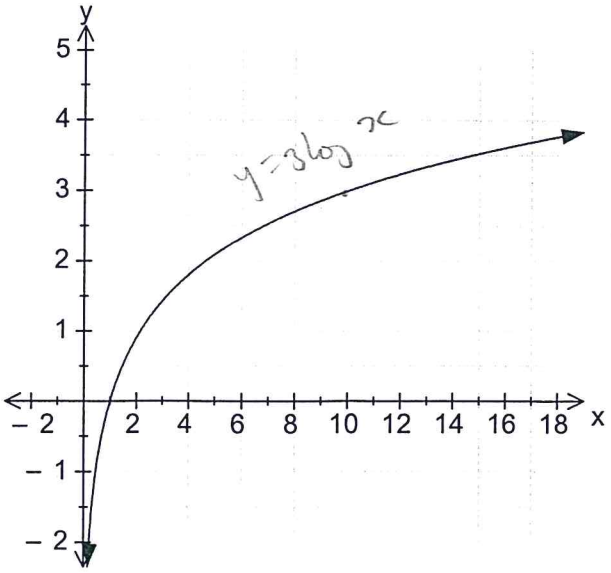


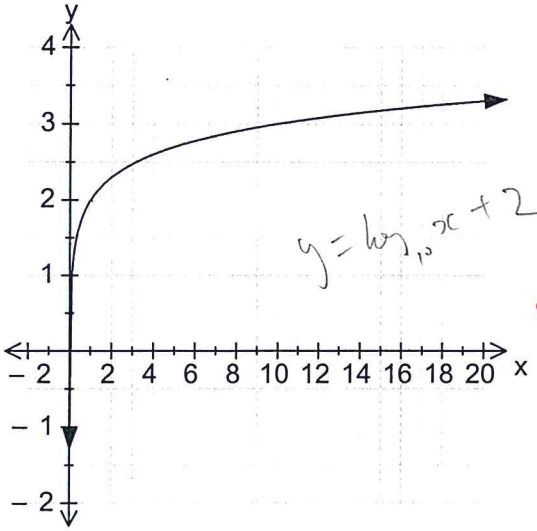






(1, 2) (10, 3)

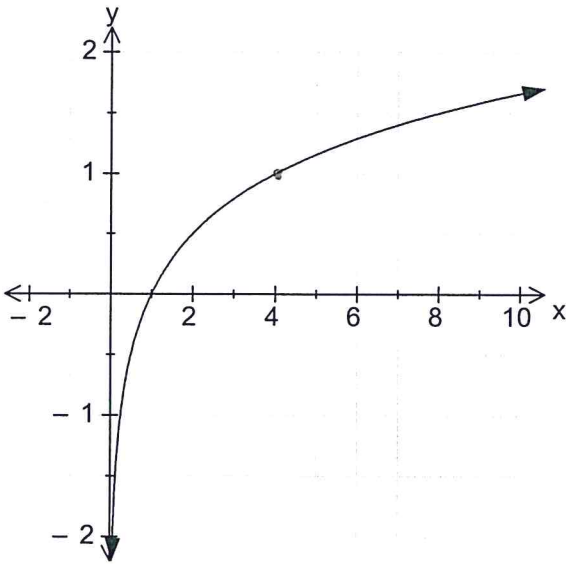




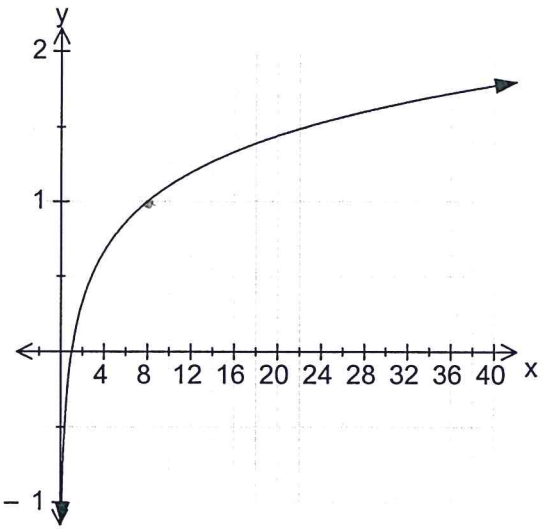
or log 100x

4. (2, 2 marks)
The function graphed in each of the following graphs is of the form $y = \log_k x$.
Examine the graph and then determine the equation.

y = $\log_4 x$

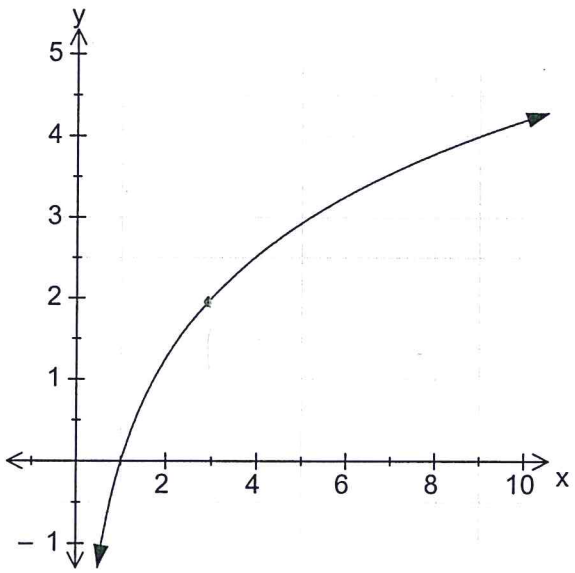


y= $\log_8 x$

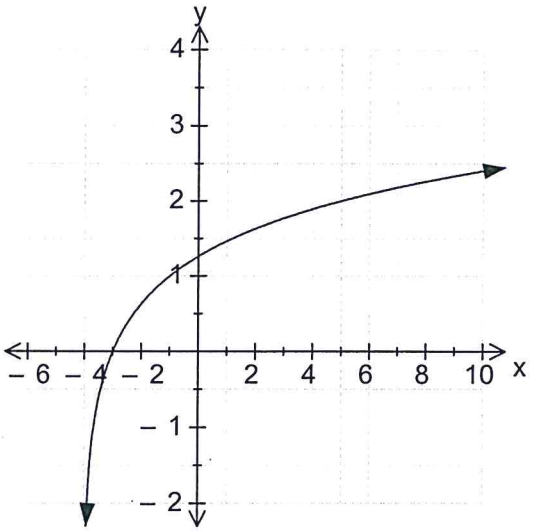


5. (2, 2 marks)
Determine the equation of the function graphed in each of the following, given that the graph is a transformation of the graph of $y = \log_3 x$.

y = $2\log_3 x$



y = $\log_3(x+4)$



6.(2 marks)
The following graph is a function of the form $y = \log_a(x + b)$. Determine the values of a and b.

y = $\log_2(x+1)$

$b = 1$

$a = 2$