

SOLUTIONS

Reading Exponential and Logarithmic Graphs

The practice midterm does not have any problems in which you are asked to answer questions about exponential or logarithmic graphs. Here are a few questions of this type.

1. Finding the base and other information about exponential graphs.

a. $f(x) = a^x$

→ What is a ? 5 Domain: $(-\infty, \infty)$

Range: $(0, \infty)$ Asymptote: $y = 0$

b. $g(x) = b^x$

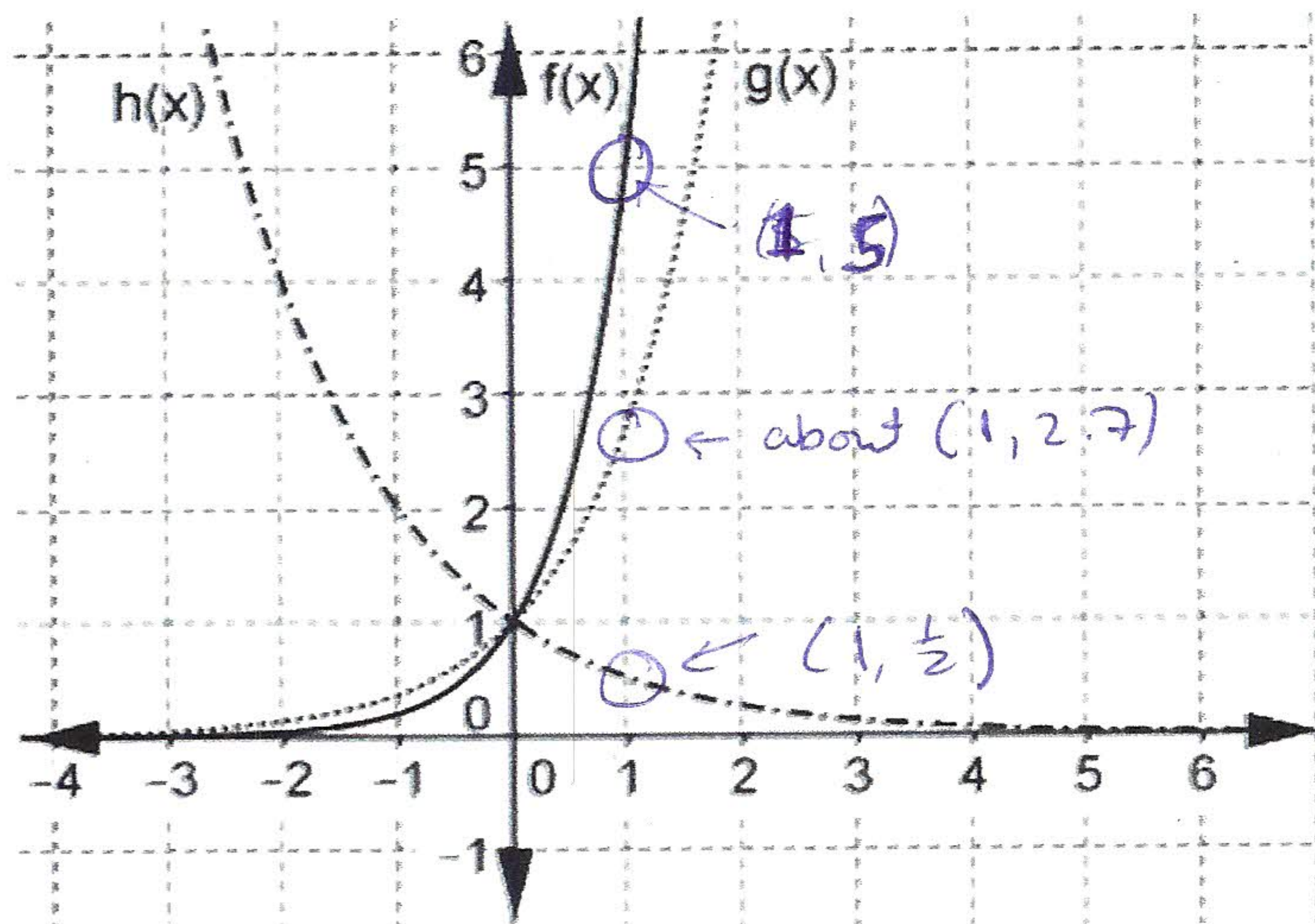
What is b ? e Domain: $(-\infty, \infty)$

Range: $(0, \infty)$ Asymptote: $y = 0$

c. $h(x) = c^x$

→ What is c ? $\frac{1}{2}$ Domain: $(-\infty, \infty)$

Range: $(0, \infty)$ Asymptote: $y = 0$



Notice that the domain, range & asymptote are the same for all of these.

2. Finding the base and other information about logarithmic graphs.

a. $f(x) = \log_a x$

What is a ? 4 Domain: $(0, \infty)$

Range: $(-\infty, \infty)$ Asymptote: $x = 0$

b. $g(x) = \log_b x$

What is b ? e Domain: $(0, \infty)$

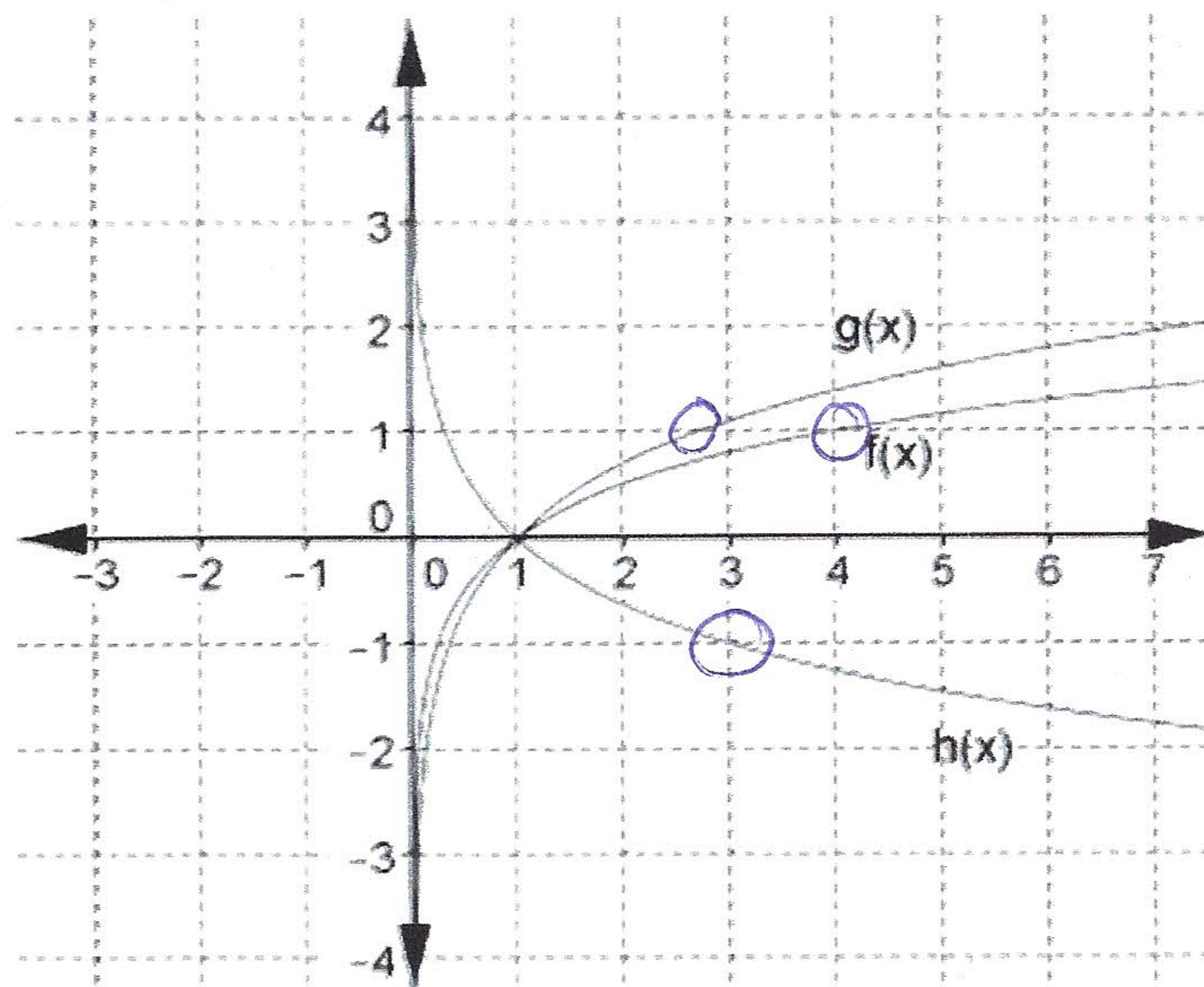
Range: $(-\infty, \infty)$ Asymptote: $x = 0$

c. $h(x) = \log_c x$ What is c ? $\frac{1}{3}$

What is c ? -1 Domain: $(0, \infty)$

Range: $(-\infty, \infty)$ Asymptote: $x = 0$

What is d ? 3



Know this from the point (1, 5) of the graph

Know this from the point $(1, \frac{1}{2})$. This makes me guess the graph is $h(x) = (\frac{1}{2})^x$. I check by looking at $(-1, 2)$. Since this is on the graph $h(-1) = (\frac{1}{2})^{-1} = 2$, this is the right function.

It's about 2.7 on the graph

3. Transformations

d. $f(x) = a^x$. What is a ? 2

e. What is the asymptote of $f(x)$? $y=0$
(write as $x=\#$ or $y=\#$)

The function $g(x)$ is a reflection of $f(x)$

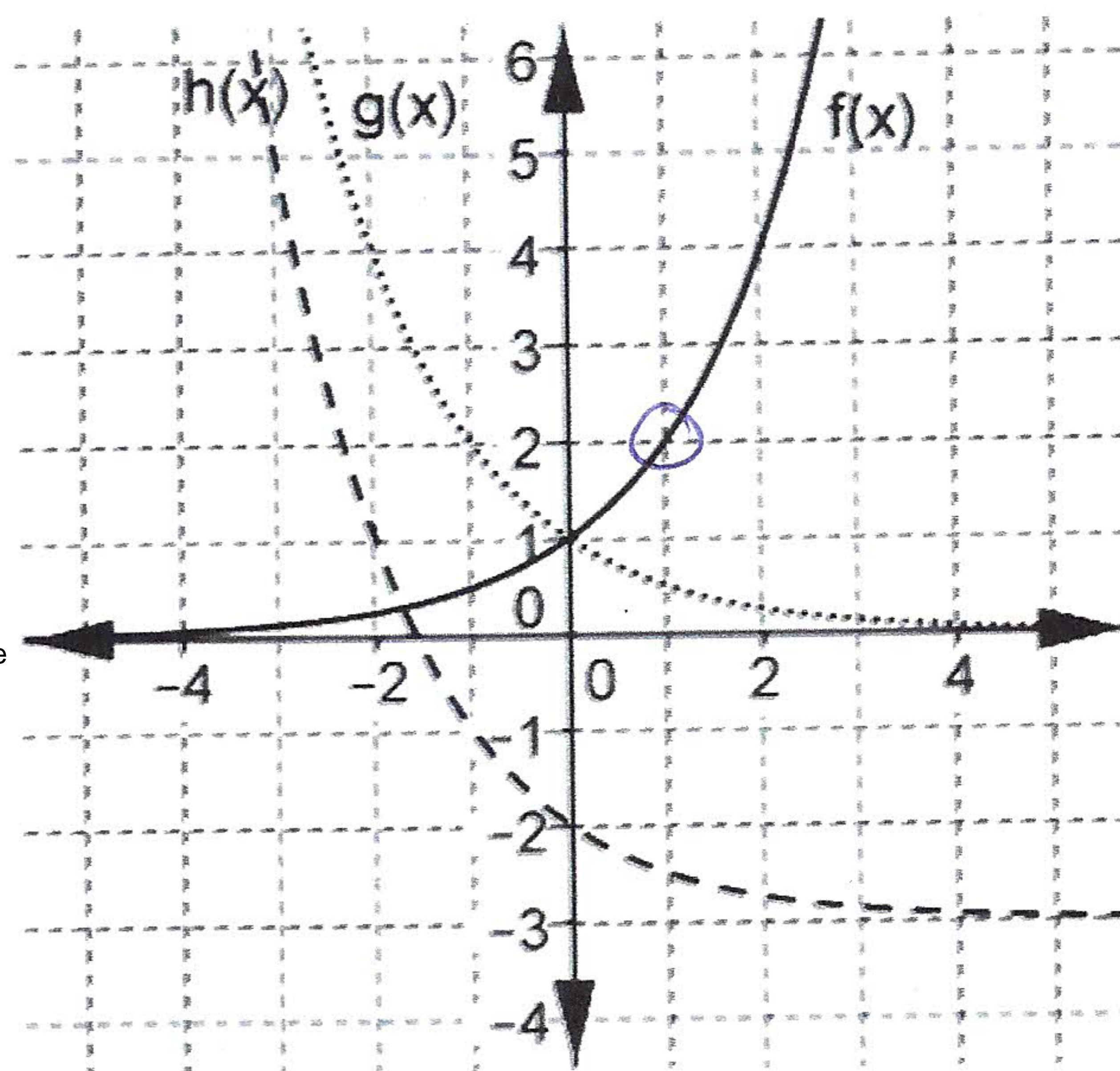
f. $g(x) = \left(\frac{1}{2}\right)^x$ or 2^{-x} Mistake in key: there should be no minus in front, but a minus with the exponent.

g. What is the asymptote of $g(x)$? $y=0$

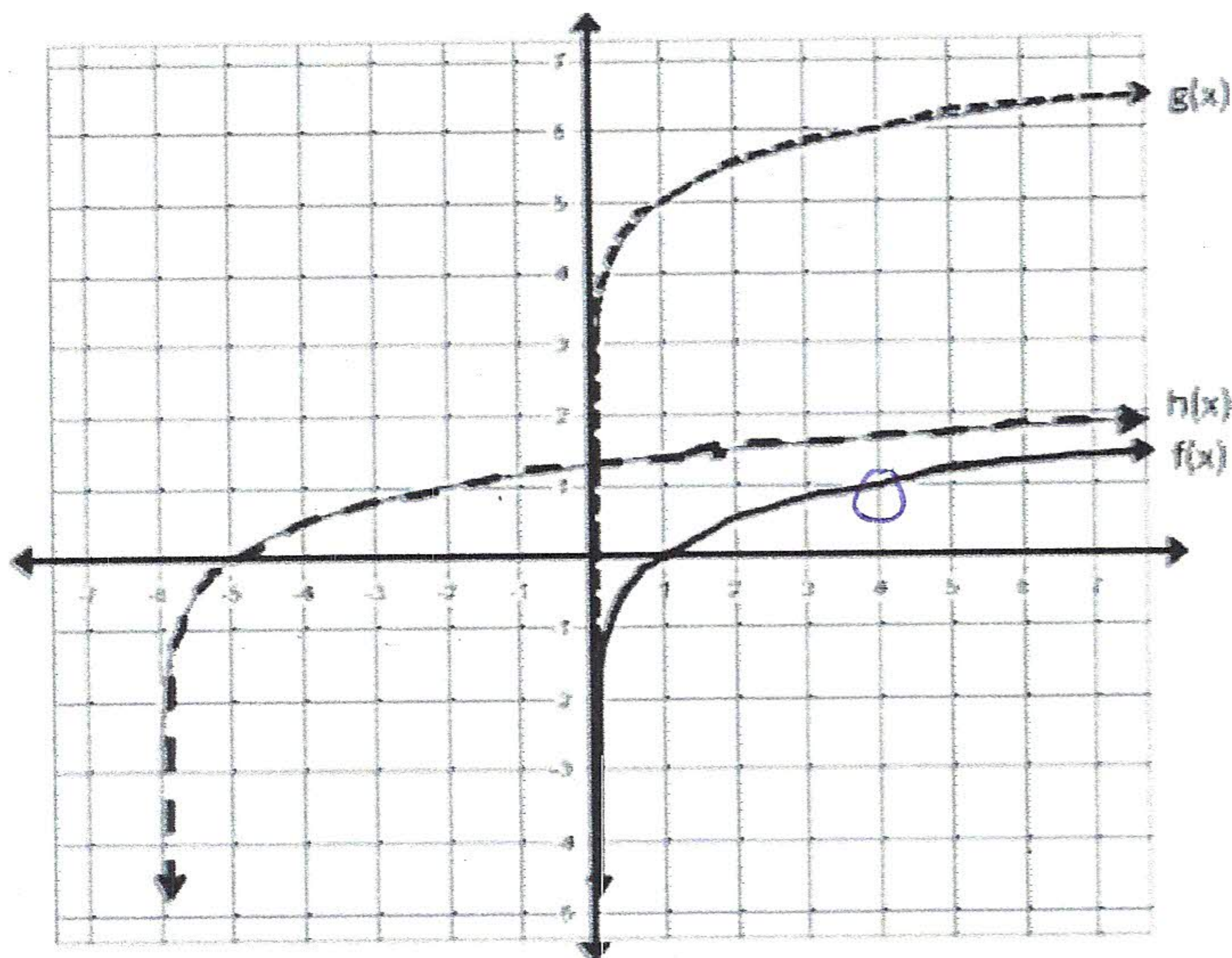
The function $h(x)$ is a translation of $g(x)$

h. $h(x) = 2^{-x} - 3$

i. What is the asymptote of $h(x)$? ~~$y=0$~~
 $y=-3$



4. Transformations. The functions $g(x)$ and $h(x)$ are translations of $f(x)$.



a. $f(x) = \log_a x$ What is a ? 4

b. What is the asymptote of $f(x)$? $x=0$
(write as $x=\#$ or $y=\#$)

c. $g(x) = \log_4 x + 5$

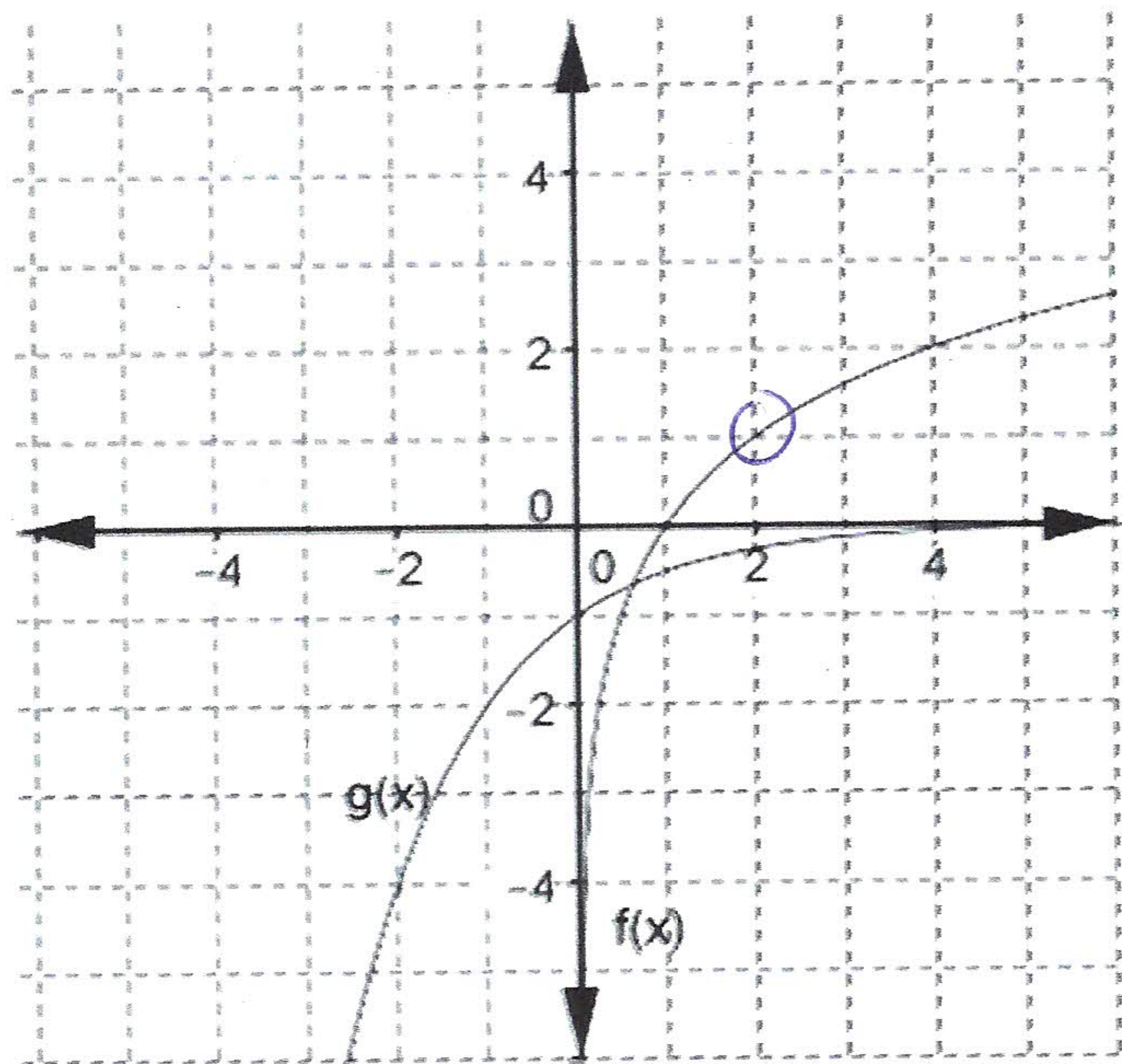
d. What is the asymptote of $g(x)$? $x=0$

e. $h(x) = \log_4 (x+6)$

f. What is the asymptote of $h(x)$? $x=-6$

5. Final Challenge: Is it an exponential graph or a log graph?

Can you find the functions for $f(x)$ and $g(x)$? One is an exponential graph. One is a log graph. One has no transformations. The other has transformations.



$$f(x) = \log_2 x$$

~~$$g(x) = \log_2$$~~

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

or

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

Interesting observations:

log graphs always have vertical asymptotes.
(no matter if they are translated, reflected or stretched)

exponential graphs always have horizontal asymptotes.