Directions: Write limit statements for the end behavior of the following logarithmic functions.

1. $f(x)=3\log_2 x$

$a>0$ and $b>1$

Left: $\lim_{x\to 0^+} f(x)=-\infty$

Right: $\lim_{x\to+\infty} f(x)=+\infty$

2. $g(x)=-2\log x$

$a<0$ and $b>1$

Left: $\lim_{x\to 0^+} g(x)=+\infty$

Right: $\lim_{x\to+\infty} g(x)=-\infty$

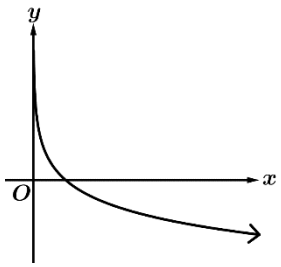
3. $h(x)=\frac{3}{4}\log_\pi x$

$a>0$ and $b>1$

Left: $\lim_{x\to 0^+} h(x)=-\infty$

Right: $\lim_{x\to+\infty} h(x)=+\infty$

Directions: The graphs of k and m are shown below. Use the graphs to answer the following.



Graph of $k(x)$

4. The graph of k is

(A) increasing at an increasing rate.
(B) increasing at a decreasing rate.
(C) decreasing at an increasing rate. Concave up
(D) decreasing at a decreasing rate.

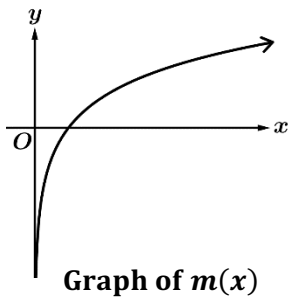
5. Which of the following pairs of limit statements correctly describes the end behavior of k?

(A) $\lim_{x\to 0^+} k(x)=-\infty$ and $\lim_{x\to\infty} k(x)=-\infty$
(B) $\lim_{x\to 0^+} k(x)=-\infty$ and $\lim_{x\to\infty} k(x)=\infty$
(C) $\lim_{x\to 0^+} k(x)=\infty$ and $\lim_{x\to\infty} k(x)=-\infty$
(D) $\lim_{x\to 0^+} k(x)=\infty$ and $\lim_{x\to\infty} k(x)=\infty$

6. Which of the following could be the equation for k?

(A) $k(x)=-2\log_4 x$ (B) $k(x)=2\log_4 x$
(C) $k(x)=-4(2)^x$ (D) $k(x)=4\left(\frac{1}{2}\right)^x$

$a<0$ and $b>1$



Graph of $m(x)$

8. The graph of m is

(A) increasing at an increasing rate.
(B) increasing at a decreasing rate. Concave down
(C) decreasing at an increasing rate.
(D) decreasing at a decreasing rate.

9. Which of the following pairs of limit statements correctly describes the end behavior of m?

(A) $\lim_{x\to 0^+} m(x)=-\infty$ and $\lim_{x\to\infty} m(x)=-\infty$
(B) $\lim_{x\to 0^+} m(x)=-\infty$ and $\lim_{x\to\infty} m(x)=\infty$
(C) $\lim_{x\to 0^+} m(x)=\infty$ and $\lim_{x\to\infty} m(x)=-\infty$
(D) $\lim_{x\to 0^+} m(x)=\infty$ and $\lim_{x\to\infty} m(x)=\infty$

10. Which of the following could be the equation for m?

(A) $m(x)=-3\log_8 x$ (B) $m(x)=3\log_8 x$
(C) $m(x)=-3(8)^x$ (D) $m(x)=3(8)^x$

$a>0$ and $b>1$

7. Which of the following equations could be k^{-1}?	11. Which of the following equations could be m^{-1}?
(A) $k^{-1}(x)=\left(\frac{1}{2}\right)^x$ (B) $k^{-1}(x)=-(2)^x$	(A) $m^{-1}(x)=\left(\frac{1}{2}\right)^x$ (B) $m^{-1}(x)=-(2)^x$
(C) $k^{-1}(x)=\frac{-1}{2\log_4 x}$ (D) $k^{-1}(x)=-2\log_4 x$	(C) $m^{-1}(x)=2^x$ (D) $m^{-1}(x)=\frac{1}{3\log_8 x}$
From 6. $x=-2\log_4 y$ $\log_4 y=-\frac{x}{2}$ $y=\left(4^{-1/2}\right)^x=\left(\frac{1}{2}\right)^x$	From 10. $x=3\log_8 y$ $\log_8 y=\frac{x}{3}$ $y=\left(8^{1/3}\right)^x=2^x$

Directions: Selected values of the several logarithmic functions are shown in the tables below. For each table, find the value of the constant k.

12.

x	$f(x)$
0.3	2
3	5
30	8
k	11
3000	14

x values are changing by multiplying by 10 over equal-length y value intervals, so $k=30(10)=300$ The next value of $x=10k=300(10)=3000$

13.

x	$g(x)$
$\frac{3}{4}$	1
3	2
k	3
48	4

x values are changing by multiplying by 4 over equal-length y value intervals, so $k=3(4)=12$ The next value of $x=4k=12(4)=48$

14.

x	$h(x)$
$12k$	$k-1$
$6k$	k
$3k$	$k+1$
6	$k+2$
3	$k+3$

x values are changing by multiplying by $\frac{1}{2}$ over equal-length y value intervals, so $\frac{1}{2}(3k)=6\Rightarrow k=4$ The x values form a sequence of $12k=12(4)=48,24,12,6,3$

15.

x	$l(x)$
3^7	4
3^5	6
27	8
3	10
k	12

x values are changing by multiplying by $\frac{1}{3^2}=\frac{1}{9}$ over equal-length y value intervals, so $k=3\left(\frac{1}{9}\right)=\frac{1}{3}$

16. Let $f(x)=3\log_5(x+4)$.

a) Find the domain and range of the function f. Domain: $x+4>0\Rightarrow x>-4$ $a>0$ and $b>1\Rightarrow$ Range is $(-\infty,\infty)$

b) If $g(x)=-2f(x-3)$, find the domain and range of g. Domain: $x>-1$ Range is $(-\infty,\infty)$

g is a horizontal shift of $f(x)$ of 3 so the domain of $g(x)$ is $x>-4+3=-1$. There is also a vertical dilation of -2 of $f(x)$ which will reflect $f(x)$ over the x–axis which will still have a range of $(-\infty,\infty)$

c) If $k(x)=f(2x)+7$, find the domain and range of k. Domain: $x>-2$ Range is $(-\infty,\infty)$

k is a horizontal dilation of $f(x)$ by a factor of $\frac{1}{2}$ so domain is $x>-4\left(\frac{1}{2}\right)=-2$ and the vertical shift of $f(x)$ does not affect the range.