Name: _____ .

Exponential and Logarithmic Functions

Do not use a calculator.

1. Let $f(x) = 2^x$.

   (a) Give the domain and range in interval notation.

        i. dom $(2^x) =$

        ii. range $(2^x) =$

   (b) Give the ordered pairs for all intercepts of f.

        i. y-intercepts:

        ii. x-intercepts:

   (c) Complete the table of values.

x	$f(x)$
-3	
-2	
-1	
0	
1	
2	
3	

   (d) Evaluate each limit.

        i. $\displaystyle\lim_{x \to -\infty} 2^x =$

        ii. $\displaystyle\lim_{x \to \infty} 2^x =$

   (e) Give the equations of all asymptotes of f.

        i. vertical asymptotes:

        ii. horizontal asymptotes:

   (f) Sketch the graph $y = f(x)$ on the coordinate system on the graph page. *Label all points computed above with their ordered pairs and all asymptotes with their equations.*

   (g) Give the formula for the inverse of f.
   $f^{-1}(x) =$

   (h) Give the domain and range in interval notation.

        i. dom $(\log_2 x) =$

        ii. range $(\log_2 x) =$

   (i) Give the ordered pairs for all intercepts of the graph $y = \log_2 x$.

        i. y-intercepts:

        ii. x-intercepts:

   (j) Evaluate each limit.

        i. $\displaystyle\lim_{x \to 0^+} \log_2 x =$

        ii. $\displaystyle\lim_{x \to \infty} \log_2 x =$

   (k) Give the equations of all asymptotes of the graph $y = \log_2 x$.

        i. vertical asymptotes:

        ii. horizontal asymptotes:

   (l) Sketch the graph $y = \log_2 x$ on the same coordinate system as $y = 2^x$. *Label at least 5 points with their ordered pairs and all asymptotes with their equations.*

2. Let $f(x) = \left(\dfrac{1}{2}\right)^x$.

(a) Give the domain and range in interval notation.

    i. dom $\left(\frac{1}{2}\right)^x =$

    ii. range $\left(\frac{1}{2}\right)^x =$

(b) Give the ordered pairs for all intercepts of f.

    i. y-intercepts:

    ii. x-intercepts:

(c) Complete the table of values.

x	$f(x)$
-3	
-2	
-1	
0	
1	
2	
3	

(d) Evaluate each limit.

    i. $\displaystyle\lim_{x \to -\infty} \left(\dfrac{1}{2}\right)^x =$

    ii. $\displaystyle\lim_{x \to \infty} \left(\dfrac{1}{2}\right)^x =$

(e) Give the equations of all asymptotes of f.

    i. vertical asymptotes:

    ii. horizontal asymptotes:

(f) Sketch the graph $y = f(x)$ on the coordinate system on the graph page. *Label all points computed above with their ordered pairs and all asymptotes with their equations.*

(g) Give the formula for the inverse of f.
$f^{-1}(x) =$

(h) Give the domain and range in interval notation.

    i. dom $\left(\log_{1/2} x\right) =$

    ii. range $\left(\log_{1/2} x\right) =$

(i) Give the ordered pairs for all intercepts of the graph $y = \log_{1/2} x$.

    i. y-intercepts:

    ii. x-intercepts:

(j) Evaluate each limit.

    i. $\displaystyle\lim_{x \to 0^+} \log_{1/2} x =$

    ii. $\displaystyle\lim_{x \to \infty} \log_{1/2} x =$

(k) Give the equations of all asymptotes of the graph $y = \log_{1/2} x$.

    i. vertical asymptotes:

    ii. horizontal asymptotes:

(l) Sketch the graph $y = \log_{1/2} x$ on the same coordinate system as $y = \left(\dfrac{1}{2}\right)^x$. *Label at least 5 points with their ordered pairs and all asymptotes with their equations.*

3. Let $f(x) = 4^x$.

(a) Give the domain and range in interval notation.

   i. dom $(4^x) =$

   ii. range $(4^x) =$

(b) Give the ordered pairs for all intercepts of f.

   i. y-intercepts:

   ii. x-intercepts:

(c) Complete the table of values.

x	$f(x)$
-2	
-1	
$-1/2$	
0	
$1/2$	
1	
2	

(d) Evaluate each limit.

   i. $\lim\limits_{x \to -\infty} 4^x =$

   ii. $\lim\limits_{x \to \infty} 4^x =$

(e) Give the equations of all asymptotes of f.

   i. vertical asymptotes:

   ii. horizontal asymptotes:

(f) Sketch the graph $y = f(x)$ on the coordinate system on the graph page. *Label all points computed above with their ordered pairs and all asymptotes with their equations.*

(g) Give the formula for the inverse of f.
$f^{-1}(x) =$

(h) Give the domain and range in interval notation.

   i. dom $(\log_4 x) =$

   ii. range $(\log_4 x) =$

(i) Give the ordered pairs for all intercepts of the graph $y = \log_4 x$.

   i. y-intercepts:

   ii. x-intercepts:

(j) Evaluate each limit.

   i. $\lim\limits_{x \to 0^+} \log_4 x =$

   ii. $\lim\limits_{x \to \infty} \log_4 x =$

(k) Give the equations of all asymptotes of the graph $y = \log_4 x$.

   i. vertical asymptotes:

   ii. horizontal asymptotes:

(l) Sketch the graph $y = \log_4 x$ on the same co-ordinate system as $y = 4^x$. *Label at least 5 points with their ordered pairs and all asymptotes with their equations.*

4. Let $f(x) = \left(\frac{1}{4}\right)^x$.

(a) Give the domain and range in interval notation.

    i. dom $\left(\frac{1}{4}\right)^x =$

    ii. range $\left(\frac{1}{4}\right)^x =$

(b) Give the ordered pairs for all intercepts of f.

    i. y-intercepts:

    ii. x-intercepts:

(c) Complete the table of values.

x	$f(x)$
-2	
-1	
$-1/2$	
0	
$1/2$	
1	
2	

(d) Evaluate each limit.

    i. $\displaystyle\lim_{x \to -\infty} \left(\frac{1}{4}\right)^x =$

    ii. $\displaystyle\lim_{x \to \infty} \left(\frac{1}{4}\right)^x =$

(e) Give the equations of all asymptotes of f.

    i. vertical asymptotes:

    ii. horizontal asymptotes:

(f) Sketch the graph $y = f(x)$ on the coordinate system on the graph page. *Label all points computed above with their ordered pairs and all asymptotes with their equations.*

(g) Give the formula for the inverse of f.
$f^{-1}(x) =$

(h) Give the domain and range in interval notation.

    i. dom $\left(\log_{1/4} x\right) =$

    ii. range $\left(\log_{1/4} x\right) =$

(i) Give the ordered pairs for all intercepts of the graph $y = \log_{1/4} x$.

    i. y-intercepts:

    ii. x-intercepts:

(j) Evaluate each limit.

    i. $\displaystyle\lim_{x \to 0^+} \log_{1/4} x =$

    ii. $\displaystyle\lim_{x \to \infty} \log_{1/4} x =$

(k) Give the equations of all asymptotes of the graph $y = \log_{1/4} x$.

    i. vertical asymptotes:

    ii. horizontal asymptotes:

(l) Sketch the graph $y = \log_{1/4} x$ on the same coordinate system as $y = \left(\frac{1}{4}\right)^x$. *Label at least 5 points with their ordered pairs and all asymptotes with their equations.*

5. Let $f(x) = e^x$.

(a) Give the domain and range in interval notation.

    i. dom $(e^x) =$

    ii. range $(e^x) =$

(b) Give the ordered pairs for all intercepts of f.

    i. y-intercepts:

    ii. x-intercepts:

(c) Evaluate each limit.

    i. $\lim\limits_{x \to -\infty} e^x =$

    ii. $\lim\limits_{x \to \infty} e^x =$

(d) Give the equations of all asymptotes of f.

    i. vertical asymptotes:

    ii. horizontal asymptotes:

(e) Sketch the graph $y = f(x)$ on the coordinate system on the graph page. *Label at least 5 points with their ordered pairs and all asymptotes with their equations. You may use the following estimates:*

$e \approx 2.7$
$e^2 \approx 7.4$

(f) Give the formula for the inverse of f.
$f^{-1}(x) =$

(g) Give the domain and range in interval notation.

    i. dom $(\ln x) =$

    ii. range $(\ln x) =$

(h) Give the ordered pairs for all intercepts of the graph $y = \ln x$.

    i. y-intercepts:

    ii. x-intercepts:

(i) Evaluate each limit.

    i. $\lim\limits_{x \to 0^+} \ln x =$

    ii. $\lim\limits_{x \to \infty} \ln x =$

(j) Give the equations of all asymptotes of the graph $y = \ln x$.
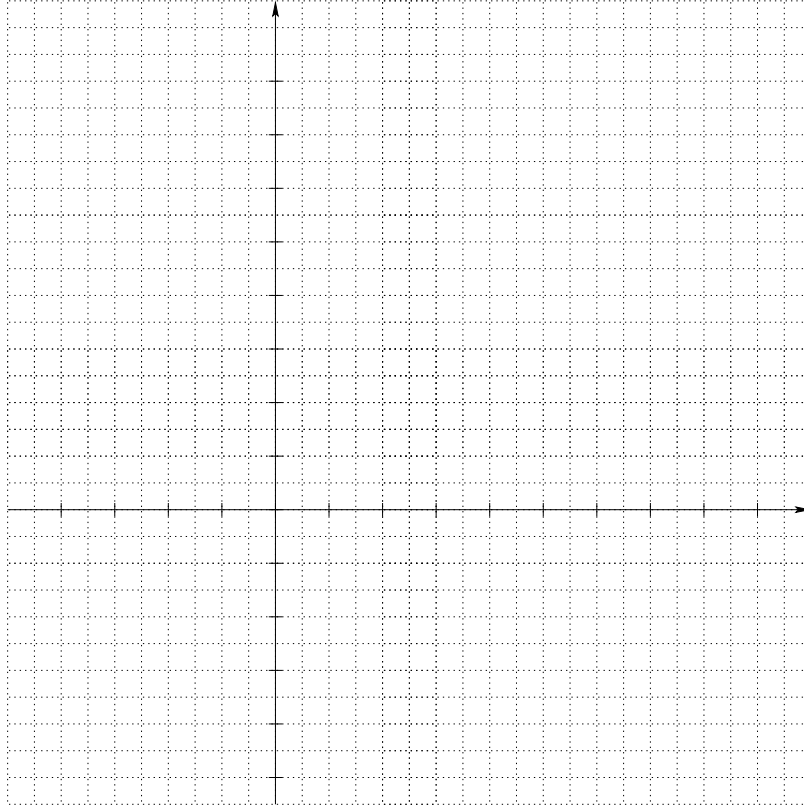
    i. vertical asymptotes:

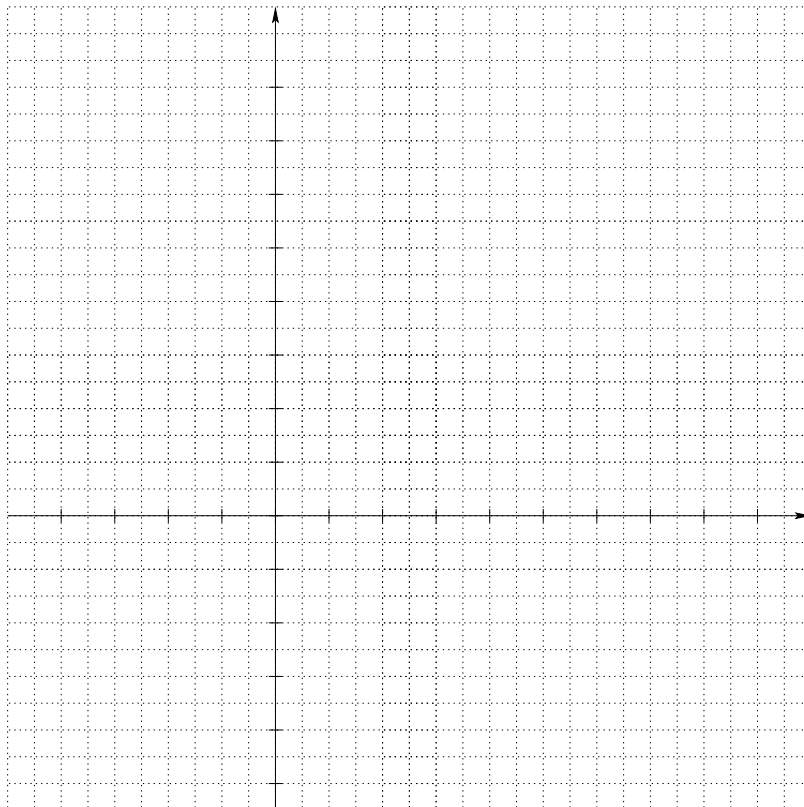   ii. horizontal asymptotes:

(k) Sketch the graph $y = \ln x$ on the same coordinate system as $y = e^x$. *Label at least 5 points with their ordered pairs and all asymptotes with their equations.*

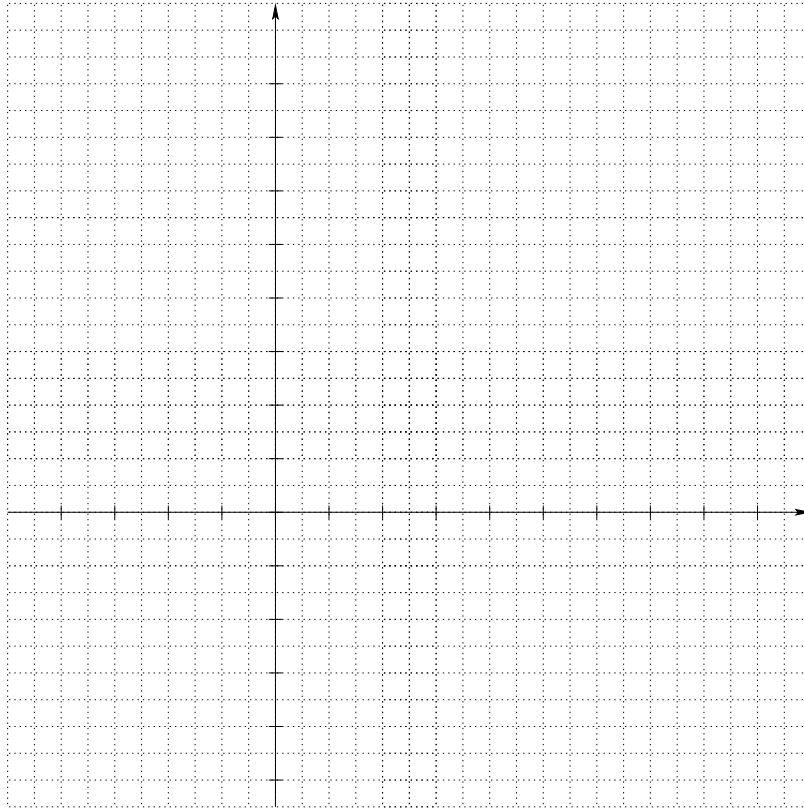# Exponential and Logarithmic Functions: Graphs
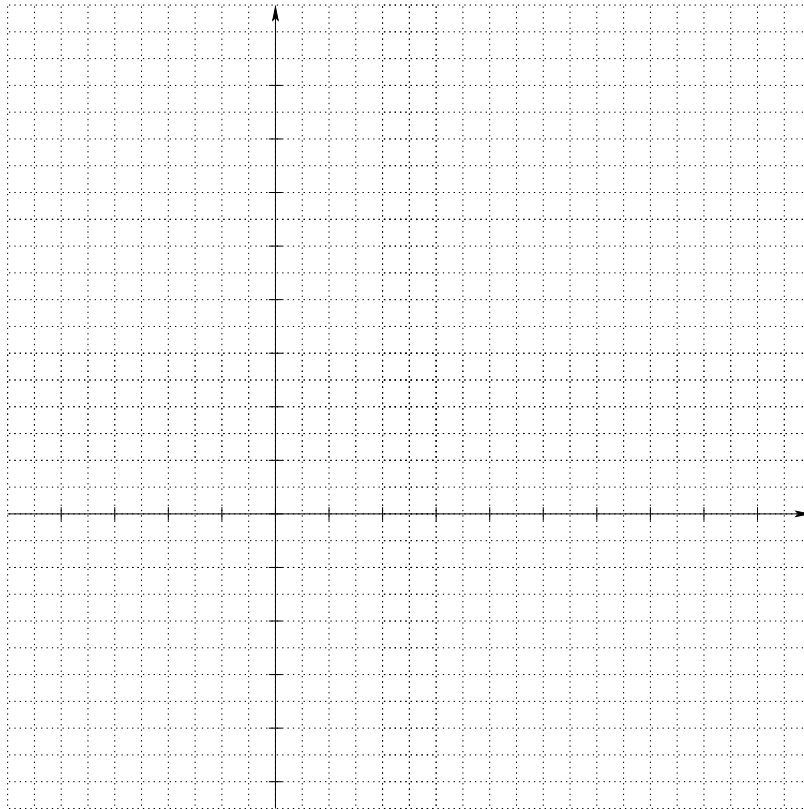
1. $y = 2^x$ and $y = \log_2 x$.

2. $y = \left(\dfrac{1}{2}\right)^x$ and $y = \log_{1/2} x$.

3. $y = 4^x$ and $y = \log_4 x$.

4. $y = \left(\dfrac{1}{4}\right)^x$ and $y = \log_{1/4} x$.

5. $y = e^x$ and $y = \ln x$.