

You should be able to solve the following without a calculator

[1] Find the domains of the following functions.

[a] $f(x) = 4^x$

[b] $f(x) = \log_3 x$

[2] Find the ranges of the following functions.

[a] $f(x) = 5^x$

[b] $f(x) = \log_7 x$

[3] Evaluate the following. Write “UNDEFINED” if the value does not exist.

[a] $\log_3 81$

[b] $\log_6 36$

[c] $\log_5 125$

[d] $\log_7 0$

[e] $\log_8 -8$

[f] $\log_6 1$

[g] $\log_2 64$

[h] $\log 10000$

[i] $\log_4 4^6$

[j] $\log_8 8^{-3}$

[k] $3^{\log_3 7}$

[l] $6^{\log_6 0}$

[m] $5^{\log_5 -10}$

[n] $10^{\log 5}$

[4] Find the exact solutions of the following equations. **Check your answers.**

[a] $3^{2-x} = 81$

[b] $8^{3x-7} = 4^{6-x}$

[c] $1 + 2 \log_4 (5x + 9) = 7$

[d] $\log_3 (x^2 - 7) - \log_3 (1 - x) = 1$

[e] $\log_2 (10x - 2) - \log_2 (x + 1) = 3$

[f] $\log (2x + 6) + \log (x - 2) = 2$

[5] Write as the logarithm of a single quantity. Simplify your answer.

[a] $\log 8 + \log 6 - \log 2$

[b] $\log 48 - \log 6 - \log 2$

[c] $5 \log 2$

[d] $3 \log x + 2 \log y$

[e] $2 \log x - \log y + \log z$

[f] $\log z - 2 \log y - \log x$

[g] $2 \log y + 3 \log z - \log x$

[h] $4 \log z + \log x + 3 \log y$

[6] Write as the sums and/or differences and/or multiples of logarithms of numbers or single variables.

[a] $\log(7 \times 11)$

[b] $\log\left(\frac{13}{5}\right)$

[c] $\log 3^8$

[d] $\log r^4 s$

[e] $\log \frac{a^5}{b^2}$

[f] $\log \frac{m}{n^2 p^3}$

[g] $\log \frac{x^2}{\sqrt{yz}}$

[7] **MULTIPLE CHOICE**

[a] The graph of $f(x) = 3 \log(x + 4)$ has an asymptote at

[i] $x = 4$

[ii] $x = -4$

[iii] $y = -4$

[iv] $y = 4$

[v] $y = 3$

[b] The graph of $f(x) = -5 \cdot 2^{x-3}$ has an asymptote at

[i] $x = 3$

[ii] $x = 0$

[iii] $y = -5$

[iv] $y = 3$

[v] $y = 0$

[c] For the logarithm curve $f(x) = \log_2 x$, as the value of $x \rightarrow \infty$, the value of $y \rightarrow$

[i] ∞

[ii] $-\infty$

[iii] 0

[iv] 1

[v] -1

[d] For the logarithm curve $f(x) = \log_5 x$, as the value of $x \rightarrow 0$, the value of $y \rightarrow$

[i] ∞

[ii] $-\infty$

[iii] 0

[iv] 1

[v] -1

[8] Find the domains of the following functions.

[a] $f(x) = x^2 + 3x$

[b] $f(x) = \frac{5}{2x-3} - 1$

[c] $f(x) = \sqrt{8-x} - 6$

[9] Find the ranges of the following functions.

[a] $f(x) = \frac{2}{x+5} - 4$

[b] $f(x) = 7 - \sqrt{x+9}$

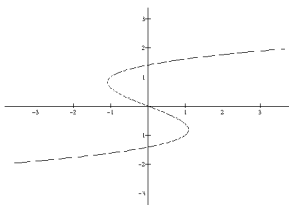
[10] Find the inverses of the following functions.

[a] $f(x) = 5 - 2x$

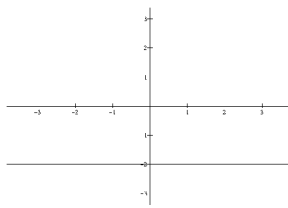
[b] $f(x) = 4 - \sqrt{3-x}$

[11] Which of the following graphs represent one-to-one functions ?

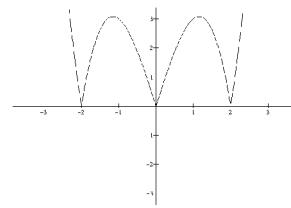
[a]



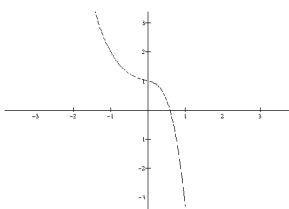
[b]



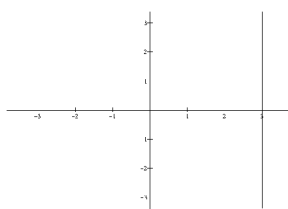
[c]



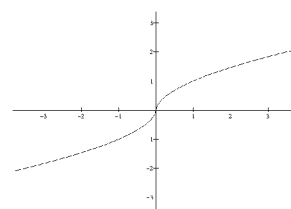
[d]



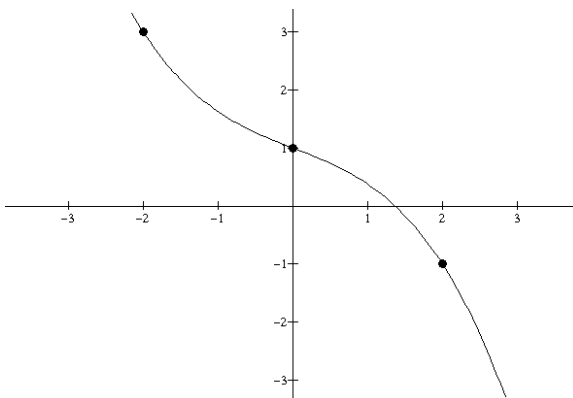
[e]



[f]



[12] Sketch the graph of the inverse of the following function.



You may use a non-graphing calculator for the following

[13] Draw the graph of $f(x) = -3 \cdot 2^{-(x-1)}$ by finding and plotting functions values, then sketching the shape of the graph. Show the function values of at least 5 points on your graph. LABEL ALL ASYMPTOTES CLEARLY.

[14] Draw the graph of $f(x) = 2 \log_2 \left(\frac{x+3}{2} \right)$ by finding and plotting functions values, then sketching the shape of the graph. Show the function values of at least 5 points on your graph. LABEL ALL ASYMPTOTES CLEARLY.

[15] Find the exact solution of the following equations. Also, use your calculator to find a decimal answer, rounded to 4 decimal places.
Check your answers.

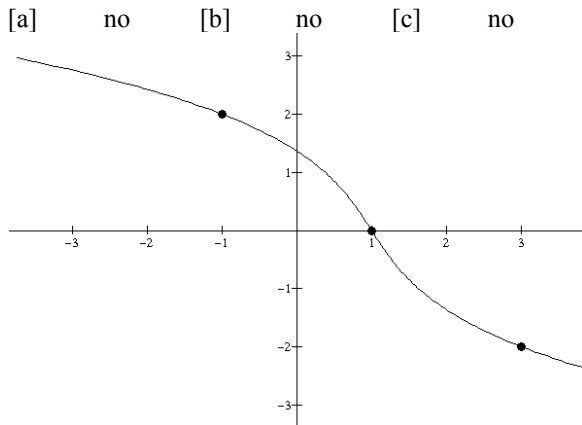
[a] $x = \log_7 3$

[b] $6^{x-2} = 4^{x+1}$

- [16] The number of bacteria in a colony is given by $B(t) = 1.3(2.1)^t$.
- [a] How many bacteria were there at time $t = 4$? Round your answer to 1 decimal place.
 [b] At what time were there at least 41 bacteria ? Round your answer to 2 decimal places.
- [17] [a] Find the intensity (in microns) of an earthquake with a Richter magnitude of 5.6.
 [b] Find the Richter magnitude of an earthquake of intensity 56,000,000 microns.
- [18] [a] If you deposit \$200 into an account that pays 2.35% interest annually, what is the value of the account 3 years later ?
 [b] If you deposit \$200 into an account that pays 2.35% interest annually, when will the value of the account be \$300 ?
 [c] How much should you deposit into an account that pays 2.35% interest annually, if you want the value of the account to be \$200 4 years later ?
 [b] You deposit \$200 into an account, and 5 years later, the value of the account is \$250. What is the annual interest rate on the account ?

ANSWERS

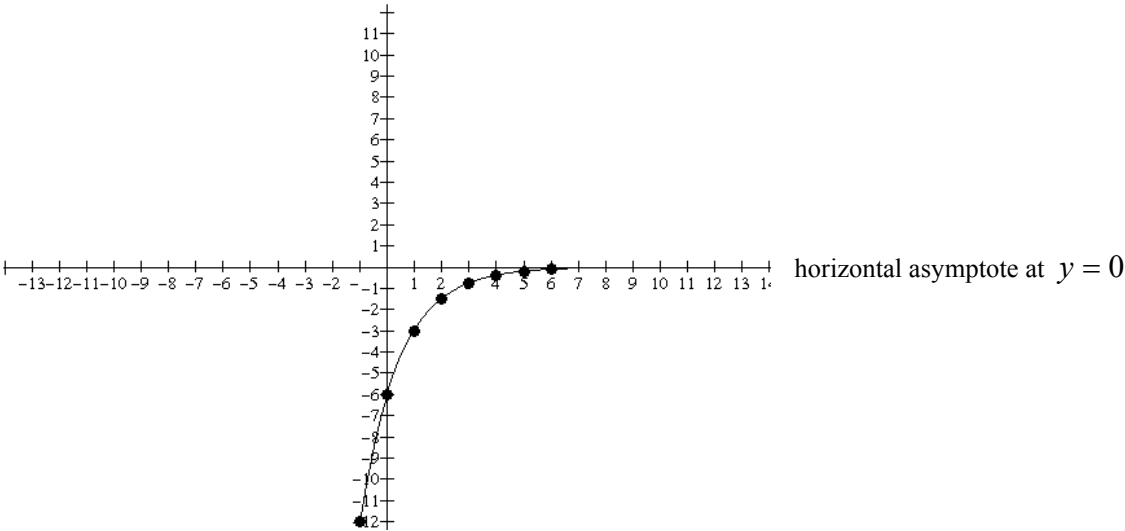
- [1] [a] all real numbers [b] $\{x > 0\}$
- [2] [a] $\{y > 0\}$ [b] all real numbers
- [3] [a] 4 [b] 2 [c] 3 [d] UNDEFINED
 [e] UNDEFINED [f] 0 [g] 6 [h] 4
 [i] 6 [j] -3 [k] 7 [l] UNDEFINED
 [m] UNDEFINED [n] 5
- [4] [a] -2 [b] 3 [c] 11 [d] -5
 [e] 5 [f] 7
- [5] [a] $\log 24$ [b] $\log 4$ [c] $\log 32$ [d] $\log x^3 y^2$
 [e] $\log \frac{x^2 z}{y}$ [f] $\log \frac{z}{y^2 x}$ [g] $\log \frac{y^2 z^3}{x}$ [h] $\log z^4 xy^3$
- [6] [a] $\log 7 + \log 11$ [b] $\log 13 - \log 5$ [c] $8 \log 3$ [d] $4 \log r + \log s$
 [e] $5 \log a - 2 \log b$ [f] $\log m - 2 \log n - 3 \log p$
 [g] $2 \log x - \frac{1}{2} \log y - \frac{1}{2} \log z$
- [7] [a]-[ii] [b]-[v] [c]-[i] [d]-[ii]
- [8] [a] all real numbers [b] $\left\{x \neq \frac{3}{2}\right\}$ [c] $\{x \leq 8\}$
- [9] [a] $\{y \neq -4\}$ [b] $\{y \leq 7\}$
- [10] [a] $f^{-1}(x) = \frac{5-x}{2}$ [b] $f^{-1}(x) = 3 - (4-x)^2$
- [11] [a] no [b] no [c] no [d] yes [e] no [f] yes



[12]

[13]

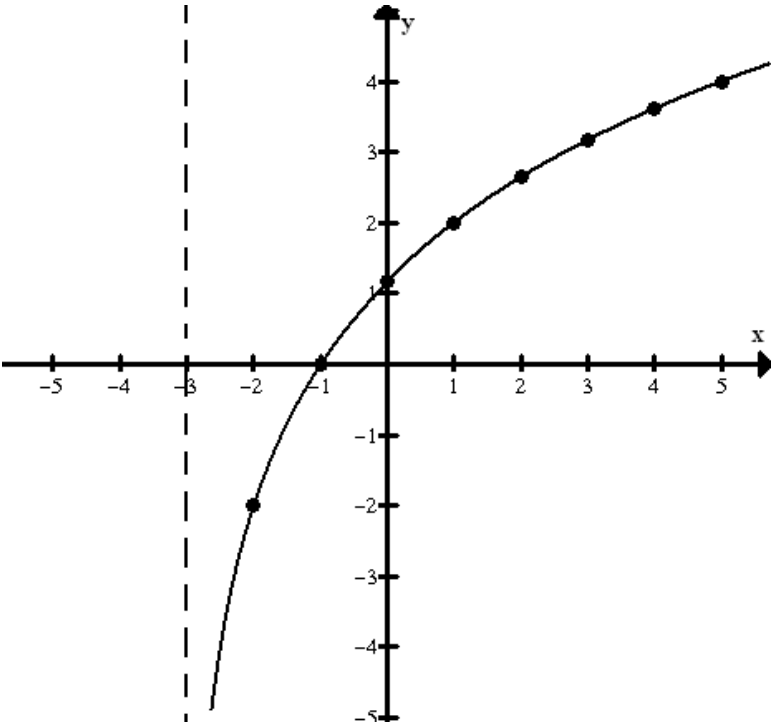
x	-1	0	1	2	3	4	5	6
$f(x)$	-12	-6	-3	$-3/2$	$-3/4$	$-3/8$	$-3/16$	$-3/32$



[14]

x	-2	-1	0	1	2	3	4	5
$f(x)$	-2	0	1.17	2	2.64	3.17	3.61	4

vertical asymptote at $x = -3$



- [15] [a] 0.5646 [b] 12.2571
- [16] [a] 25.3 bacteria [b] 4.65 units of time
- [17] [a] 398107 microns [b] 7.748
- [18] [a] \$214.43 [b] 17.46 years later [c] \$182.25 [d] 4.564%