

Name: Answers

Date: _____

Homework: Logarithmic Functions

Honors PreCalculus

Graph each logarithm. State the domain, range and asymptotes.

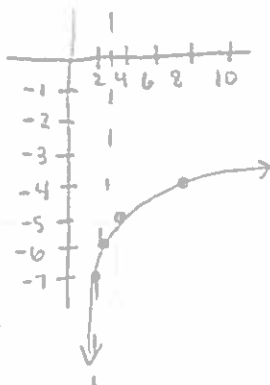
1. $y = \log_6(x - 3) - 5$

right +3
down 5

$y = \log_6 x$
 $x = \log_6 y$ → switch x+y
 $6^x = y$ → convert to exponential form

X	Y	X	Y	X+3	Y-5
-2	1/36	1/36	-2	3.028	-7
-1	1/6	1/6	-1	3.167	-6
0	1	1	0	4	-5
1	6	6	1	9	-4
2	36	36	2	39	-3

switch x+y back



VA: $x=3$
 D: $(3, \infty)$
 R: $(-\infty, \infty)$

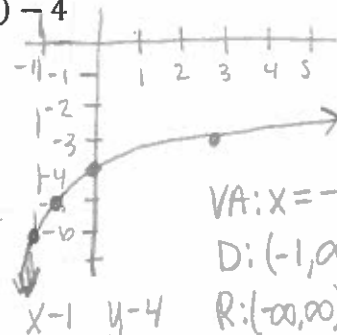
2. $f(x) = \log_4(x + 1) - 4$

left 1
down 4

$y = \log_4 x$
 $x = \log_4 y$ → switch x+y
 $4^x = y$ → convert to exp. form

X	Y	X	Y	X-1	Y-4
-2	1/16	1/16	-2	-0.9375	-6
-1	1/4	1/4	-1	-0.75	-5
0	1	1	0	0	-4
1	4	4	1	3	-3
2	16	16	2	15	-2

switch x+y back



VA: $x=-1$
 D: $(-1, \infty)$
 R: $(-\infty, \infty)$

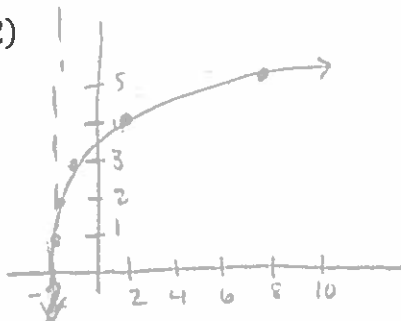
3. $y = 3 + \log_3(x + 2)$

up 3
left 2

$y = \log_3 x$
 $x = \log_3 y$ → switch x+y
 $3^x = y$ → convert to exponential form

X	Y	X	Y	X-2	Y+3
-2	1/9	1/9	-2	-1.89	1
-1	1/3	1/3	-1	-1.67	2
0	1	1	0	-1	3
1	3	3	1	1	4
2	9	9	2	7	5

switch x+y back



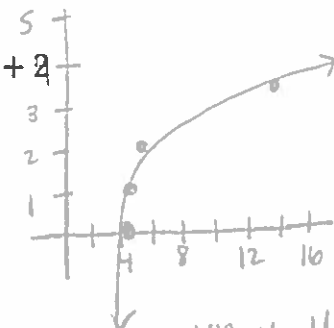
VA: $x=-2$
 D: $(-2, \infty)$
 R: $(-\infty, \infty)$

4. $f(x) = \log(x - 4) + 2$

up 2
right 4

$y = \log x$
 $x = \log y$ → switch x+y
 $10^x = y$ → convert to exponential form

X	Y	X	Y	X+4	Y+2
-2	1/100	1/100	-2	4.001	0
-1	1/10	1/10	-1	4.1	1
0	1	1	0	5	2
1	10	10	1	14	3
2	100	100	2	104	4



VA: $x=4$
 D: $(4, \infty)$
 R: $(-\infty, \infty)$

Find the exact value of each logarithm if possible. If not, use change of base and your calculator and round to three decimal places.

5. $\log_3 \frac{1}{243} = x$

$$3^x = \frac{1}{243}$$

$$x = -5$$

6. $\log_{343} 7 = x$

$$343^x = 7$$

$$x = \frac{1}{3}$$

7. $\log_6 \frac{1}{216} = x$

$$6^x = \frac{1}{216}$$

$$x = -3$$

8. $12^{\log_{12} 144} = x$

$$\log_{12} x = \log_{12} 144$$

$$x = 144$$

9. $\log_{1/2} 16 = x$

$$\left(\frac{1}{2}\right)^x = 16$$

$$x = -4$$

10. $\log_{1/3} 9 = x$

$$\left(\frac{1}{3}\right)^x = 9$$

$$x = -2$$

11. $\log \sqrt{10} = x$

$$10^x = \sqrt{10}$$

$$x = \frac{1}{2}$$

12. $\log_5 \sqrt[3]{25} = x$

$$5^x = \sqrt[3]{25}$$

$$5^x = \sqrt[3]{5^2}$$

$$x = \frac{2}{3}$$

13. $5^{\log_5 17} = x$

$$\log_5 x = \log_5 17$$

$$x = 17$$

14. $\log_{\sqrt{5}} 8 = x$

$$\frac{\log 8}{\log \sqrt{5}} = x$$

$$2.584 = x$$

15. $\log_{\sqrt{3}} 9 = x$

$$\sqrt{3}^x = 9$$

$$(3)^{\frac{1}{2}x} = 9$$

$$3^{\frac{1}{2}x} = 3^2$$

$$x = 4$$

16. $\ln \frac{5}{3} = x$

$$.511 = x$$

17. $\ln \sqrt{e} = x$

base e

$$e^x = \sqrt{e}$$

$$x = \frac{1}{2}$$

18. $\ln e^3 = x$

$$e^x = e^3$$

$$x = 3$$

19. Find a so that the graph of $f(x) = \log_a x$ contains the point $(2, 2)$.

$$2 = \log_a 2$$

$$a^2 = 2$$

$$a = \sqrt{2}$$

20. Find a so that the graph of $f(x) = \log_a x$ contains the point $(\frac{1}{2}, -4)$.

$$-4 = \log_a \frac{1}{2}$$

$$a^{-4} = \frac{1}{2}$$

$$a^4 = 2 \quad \boxed{a = \sqrt[4]{2}}$$

21. Find the domain of each function.

a) $f(x) = 3 - 2 \log_4 \left[\frac{x}{2} - 5 \right]$

$$\frac{x}{2} - 5 > 0$$

$$\frac{x}{2} > 5$$

$$x > 10$$

$$\boxed{D: (10, \infty)}$$

(what you plug into the log must be positive)... so... set the part in the log greater than 0.

b) $f(x) = \log_2 \sqrt{3x - 2}$

$$\sqrt{3x - 2} > 0$$

$$3x - 2 > 0$$

$$3x > 2$$

$$x > \frac{2}{3}$$

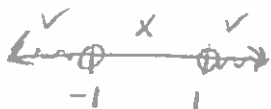
$$\boxed{D: \left(\frac{2}{3}, \infty\right)}$$

c) $f(x) = \log_3(x^2 - 1)$

$$x^2 - 1 > 0$$

$$(x-1)(x+1) > 0$$

(test intervals)



$$(-\infty, -1) \cup (1, \infty)$$

