

Section 7-5 Logarithmic Functions

Warm up:

Find the patterns in the data and what type of function it is:

x	f(x)
1	4
3	7
5	10
7	13
9	16

Linear
Add-Add

x	f(x)
1	15
3	45
5	135
7	405
9	1215

Exponential
Add-Mult

x	f(x)
2	5
4	25
8	125
16	625
32	3125

Power
Mult-Mult

x	f(x)
4	5
5	7
6	11
7	17
8	25

Quadratic
Const. 2nd diff.

Exponential function

$$y = a \cdot b^x$$

add-multiply

x	f(x)
10	200
12	300
14	450
16	675

Logarithm Function

$$y = a + b \log_c x \quad \text{or} \quad y = a + b \ln x$$

multiply-add

x	f(x)
200	10
300	12
450	14
675	16

Use the first and last points to find algebraically the particular equation of the natural logarithmic function that fits the points.

1.

x	f(x)
200	10
300	12
450	14
675	16

$$16 = a + 4.93 \cdot \ln 200$$

$$10 - 4.93 \cdot \ln 200 = a$$

$$a = -16.1207$$

$$\begin{aligned} 10 &= a + b \ln 200 \\ 16 &= a + b \ln 675 \end{aligned}$$

$$b = b \ln 675 - b \ln 200$$

$$b = b (\ln 675 - \ln 200)$$

$$\frac{b}{\ln 675 - \ln 200} = b \quad b = 4.93$$

$$y = -16.12 + 4.93 \ln x$$

2.

x	f(x)
1	2
10	3
100	4
1000	5

$$\begin{aligned} 2 &= a + b \ln 1 \\ 5 &= a + b \ln 1000 \end{aligned}$$

$$3 = b \ln 1000 - b \ln 1$$

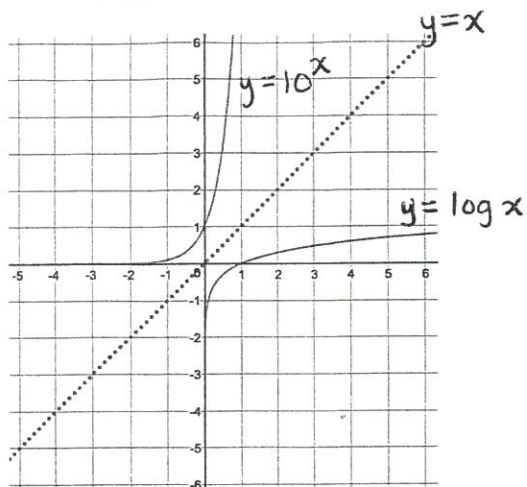
$$\frac{3}{\ln 1000 - \ln 1} = b \quad b = .4343$$

$$2 = a + .4343 \ln 1$$

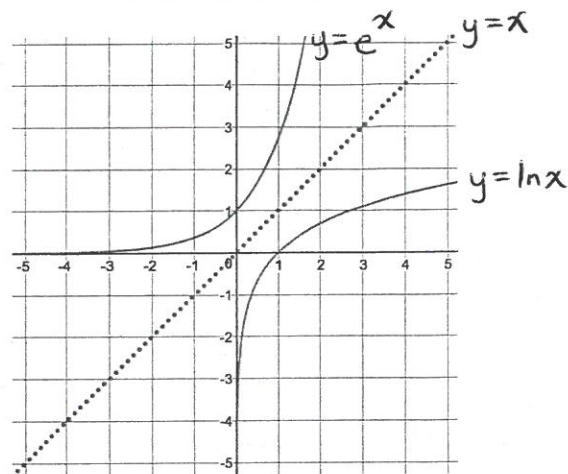
$$2 - .4343 \ln 1 = a \quad a = 2$$

$$y = 2 + 0.4343 \ln x$$

$y = \log x$
Domain: $x > 0$



$y = \ln x$
Domain: $x > 0$



Graph:

$f(x) = 5 \log(x + 4)$

$g(x) = \ln(7x - 1)$

$h(x) = \log_8(x^2 - 4)$ $x^2 = 4$
 $x = \pm 2$

$p(x) = 6 \log(2 - x)$

$q(x) = 4 - \ln x$

$m(x) = -3 + \log x$

Domain:

$x > -4$

$x > \frac{1}{7}$

$x > 2$ or $x < -2$

$x < 2$

$x > 0$

$x > 0$