

Section 9 – 4A1:**Logarithmic Functions****Finding the y Intercept for a increasing logarithmic function****To find the x intercept let $y = 0$** **Get the log expression alone.****Convert the log expression to an exponential expression. Solve for x**

Find the x intercept for

$$y = \log_2 x$$

if $y = 0$

$$0 = \log_2 x$$

$$2^0 = x$$

$$1 = x$$

$$(1,0)$$

Example 1

Find the x intercept for

$$y = \log_2(x - 3)$$

if $y = 0$

$$0 = \log_2(x - 3)$$

$$2^0 = x - 3$$

$$1 + 3 = x$$

$$4 = x$$

$$(4,0)$$

Example 2

Find the x intercept for

$$y = \log_4(x + 6)$$

if $y = 0$

$$0 = \log_4(x + 6)$$

$$4^0 = x + 6$$

$$1 - 6 = x$$

$$-5 = x$$

$$(-5,0)$$

Example 3

Find the x intercept for

$$y = \log_2(x) - 3$$

if $y = 0$

$$0 = \log_2(x) - 3$$

$$3 = \log_2(x)$$

$$2^3 = x$$

$$8 = x$$

$$(8,0)$$

Example 4

Find the x intercept for

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

if $y = 0$

$$0 = \log_3(x) + 2$$

$$-2 = \log_3(x)$$

$$3^{-2} = x$$

$$1/9 = x$$

$$(1/9,0)$$

Example 5

Find the x intercept for

$$y = \log_5(-x)$$

if $y = 0$

$$0 = \log_5(-x)$$

$$5^0 = \log_3(-x)$$

$$1 = xx$$

$$-1 = x$$

$$(-1,0)$$

Example 6

Find the x intercept for

$$y = -\log_2(x)$$

if $y = 0$

$$0 = -\log_2(x)$$

$$-0 = \log_3(x)$$

$$3^0 = x$$

$$1 = x$$

$$(1,0)$$

Finding the y Intercept for a decreasing exponential function

To find the x intercept let $y = 0$

Get the log expression alone.

Convert the log expression to an exponential expression. Solve for x

Find the y intercept for

$$y = (1/2)^x$$

$$\text{if } x = 0$$

$$y = (1/2)^0$$

$$y = 1$$

$$(0,1)$$

Example 7

Find the x intercept for

$$y = \log_{1/2}(x - 4)$$

$$\text{if } y = 0$$

$$0 = \log_{1/2}(x - 4)$$

$$(1/2)^0 = x - 4$$

$$1 + 4 = x$$

$$5 = x$$

$$(5,0)$$

Example 8

Find the x intercept for

$$y = \log_{1/4}(x + 3)$$

$$\text{if } y = 0$$

$$0 = \log_{1/4}(x - 4)$$

$$(1/4)^0 = x + 3$$

$$1 - 3 = x$$

$$-2 = x$$

$$(-2,0)$$

Example 9

Find the x intercept for

$$y = \log_{1/2}(x) + 3$$

$$\text{if } y = 0$$

$$0 = \log_{1/2}(x) + 3$$

$$-3 = \log_{1/2}(x)$$

$$(1/2)^{-3} = x$$

$$-8 = x$$

$$(-8,0)$$

Example 10

Find the x intercept for

$$y = \log_{1/3}(x) - 4$$

$$\text{if } y = 0$$

$$0 = \log_{1/3}(x) - 4$$

$$4 = \log_{1/3}(x)$$

$$(1/3)^4 = x$$

$$1/81 = x$$

$$(1/81,0)$$

Example 11

Find the x intercept for

$$y = \log_{1/5}(-x)$$

$$\text{if } y = 0$$

$$0 = \log_{1/5}(-x)$$

$$(1/5)^0 = -x$$

$$1 = -x$$

$$-1 = x$$

$$(-1,0)$$

Example 12

Find the x intercept for

$$y = -\log_{1/4}(x)$$

$$\text{if } y = 0$$

$$0 = -\log_{1/4}(x)$$

$$-0 = \log_{1/4}(x)$$

$$(1/4)^0 = x$$

$$1 = x$$

$$(1,0)$$

Finding the value for y given a value for x

for a **decreasing** exponential function

f (3) means that **x = 3**
f (x) can be replaced with the variable **y**

Example 13

$$f(x) = \log_3(x - 2)$$

find $f(11)$

$$y = \log_3(11 - 2)$$
$$y = \log_3(9)$$

[to find $\log_3(9)$
ask what power of 3 is 9
 $\log_3(9) = 2$]

$$y = \log_3(9)$$
$$y = 2$$

(11, 2)

Example 14

$$f(x) = \log_2(x + 6)$$

find $f(10)$

$$y = \log_3(10 + 6)$$
$$y = \log_2(16)$$

[to find $\log_2(16)$
ask what power of 2 is 16
 $\log_2(16) = 4$]

$$y = \log_2(16)$$
$$y = 4$$

(10, 4)

Example 15

$$f(x) = \log_2(x) + 4$$

find $f(8)$

$$y = \log_2(8) + 4$$

[to find $\log_2(8)$
ask what power of 2 is 8
 $\log_2(8) = 3$]

$$y = \log_2(8) + 4$$
$$y = 3 + 4$$
$$y = 7$$

(8, 7)

Example 16

$$f(x) = \log_4(x) + 6$$

find $f(64)$

$$y = \log_4(64) + 6$$

[to find $\log_4(64)$
ask what power of 4 is 64
 $\log_4(64) = 3$]

$$y = \log_4(64) + 6$$
$$y = 3 + 6$$
$$y = 9$$

(64, 9)

Example 17

$$f(x) = \log_3(-x)$$

find $f(-81)$

$$y = \log_3(-(-81))$$

$y = \log_3(81)$
[to find $\log_3(81)$
ask what power of 3 is 81

$$\log_3(81) = 4$$
$$y = \log_3(81)$$
$$y = 4$$

(-81, 4)

Example 18

$$f(x) = -\log_5(x)$$

find $f(25)$

$$y = -\log_5(25)$$

[to find $\log_5(25)$
ask what power of 5 is 25
 $\log_5(25) = 2$]

$$y = -\log_5(25)$$
$$y = -(2)$$
$$y = -2$$

(25, -2)

Finding the value for y given a value for x

for a **decreasing** exponential function

f (1/3) means that **x = 1/3**

f (x) can be replaced with the variable **y**

Example 19

$$f(x) = \log_{1/2}(x-2)$$

find $f(10)$

$$y = \log_{1/2}(10-2)$$
$$y = \log_{1/2}(8)$$

[to find $\log_{1/2}(8)$
ask what power of $1/2$ is 8

$$\log_{1/2}(8) = -3]$$

$$y = -3$$

$$(10, -3)$$

Example 20

$$f(x) = \log_{1/3}(x+5)$$

find $f(-4)$

$$y = \log_{1/3}(-4+5)$$
$$y = \log_{1/3}(1)$$

[to find $\log_{1/3}(1)$
ask what power of $1/3$ is 1

$$\log_{1/3}(1) = 0]$$

$$y = 0$$

$$(-4, 0)$$

Example 21

$$f(x) = \log_{1/2}(x) + 1$$

find $f(1/8)$

$$y = \log_{1/2}(1/8) + 1$$

[to find $\log_{1/2}(1/8)$
ask what power of $1/2$ is $1/8$

$$\log_{1/2}(1/8) = 3]$$

$$y = \log_{1/2}(1/8) + 1$$

$$y = 3 + 1$$

$$y = 4$$

$$(1/8, 4)$$

Example 22

$$f(x) = \log_{1/4}(x) - 3$$

find $f(16)$

$$y = \log_{1/4}(16) - 3$$

[to find $\log_{1/4}(16)$
ask what power of $1/4$ is 16

$$\log_{1/4}(16) = -2]$$

$$y = \log_{1/4}(16) - 3$$

$$y = -2 - 3$$

$$y = -5$$

$$(16, -5)$$

Example 23

$$f(x) = \log_{1/5}(-x)$$

find $f(-25)$

$$y = \log_{1/5}(-(-25))$$

$$y = \log_{1/5}(25)$$

[to find $\log_{1/5}(25)$
ask what power of $1/5$ is 25

$$\log_{1/5}(25) = -2]$$

$$y = \log_{1/5}(25)$$

$$y = -2$$

$$(-25, -2)$$

Example 24

$$f(x) = -\log_{1/3}(x)$$

find $f(81)$

$$y = -\log_{1/3}(81)$$

[to find $\log_{1/3}(81)$
ask what power of $1/3$ is 81

$$\log_{1/3}(81) = -4]$$

$$y = -\log_{1/3}(81)$$

$$y = -(-4)$$

$$y = 4$$

$$(81, 4)$$