C12 - 8.1 - $\log_b a = ?$ Definition Notes

The Definition of a Logarithm:

$\log_3 9 = ?$
$\log_3 9 = 2$

$? = 2$

Think: What power do you have to raise 3 to, to equal 9?

$\log_2 8 = ?$
$\log_2 8 = 3$

$? = 3$

8 equals 2 to what power?

$$\log_b a = c$$

'a' is the thing you are logging

'c' is the answer/exponent

'b' is the base.

Switching from Log Form to Exponential Form:

$$\log_b a = c \quad \textit{Log Form}$$

$$a = b^c \quad \textit{Exponential Form}$$

The thing you are Logging equals the Base to the other side.

Remember:
The base of the log is the base of the exponent.

The exponent is the Answer.

Log Form

$\log_2 16 = ?$
$\log_2 16 = 4$

$? = 4$

16 equals 2 to what power?

Exponential Form

$16 = 2^?$
$2^4 = 2^x$

$? = 4$

Log Form -> Exponential Form and Solve for x

$\log_2 16 = x$ — Set Log arbitrarily $= x$

$16 = 2^x$ — Exponential Form
$2^4 = 2^x$ — Change of Base

$x = 4$ — Same Base: Make exponents equal to each other

$\log_2 16 = 4$

$\log_{\frac{1}{2}} 16 = x$

$16 = \left(\frac{1}{2}\right)^x$ — Exponential Form
$2^4 = (2^{-1})^x$ — Change of Base
$2^4 = 2^{-x}$ — Exponent Laws
$4 = -x$ — Solve

$x = -4$

$\log_3\left(\frac{1}{27}\right) = x$

$\frac{1}{27} = 3^x$ — Exponential Form
$\frac{1}{3^3} = 3^x$ — Change of Base
$3^{-3} = 3^x$ — Exponent Laws

$x = -3$

$\log_{2a} 16a^4 = x$

$16a^4 = (2a)^x$ — Exponential Form
$(2a)^4 = (2a)^x$ — Change of Base

$x = 4$

C12 - 8.1 - $\log_b x = c, \log_x a = c, \log_b a = x$ *Notes*

Log Form -> Exponential Form and Solve for x

The base of the log is the base of the exponent

$\log_5 125 = x$

$125 = 5^x$ Exponential Form

$5^3 = 5^x$ Change of Base

$x = 3$ Same Base: Make exponents equal to each other

$\log_4 x = 3$

$x = 4^3$ Exponential Form

$x = 64$ Solve

$\log_6 x = 2$

$x = 6^2$

$x = 36$

$\log_5 x = -2$

$x = 5^{-2}$

$x = \frac{1}{5^2}$ Exponent Laws

$x = \frac{1}{25}$ Solve

$\log_9 x = \frac{1}{2}$

$x = 9^{\frac{1}{2}}$

$x = \sqrt{9}$

$x = 3$

$\log_x 64 = 3$

$64 = x^3$ Exponential Form

$4^3 = x^3$ Change of Base

$x = 4$ Solve

$\log_x 32 = 5$

$32 = x^5$ Exponential Form

$2^5 = x^5$ Change of Base

$\sqrt[5]{2^5} = \sqrt[5]{x^5}$ Fifth Root Both Sides

$x = 5$ Solve

$\log_x 27 = \frac{3}{2}$

$27 = x^{\frac{3}{2}}$

$27^{\frac{2}{3}} = \left(x^{\frac{3}{2}}\right)^{\frac{2}{3}}$

$27^{\frac{2}{3}} = x^1$

$\sqrt[3]{27^2} = x$

$x = 9$

Take both/ sides to reciprocal exponent

$\log_2(x-5) = 3$

$x - 5 = 2^3$

$x = 8 + 5$

$x = 13$

$x - 5 > 0$

$x > 5$

$\log_{x-2} 1 = 2$

$1 = (x-2)^2$

$1 = (x-2)(x-2)$

$1 = x^2 - 4x + 4$

$x^2 - 4x + 3 = 0$

$(x-3)(x-1) = 0$

~~$x = 3$~~ $x = 1$

$x - 2 > 0$

$x > 2$

$x - 2 \neq 1$

$x \neq 3$

$log_{x-3} 2 = 1$

$2 = (x-3)^1$

$2 = x - 3$

$x = 5$

$x - 3 > 0$

$x > 3$

$x - 3 \neq 1$

$x \neq 4$

$\log_2 16 = x + 2$

$16 = 2^{x+2}$

$2^4 = 2^{x+2}$

$4 = x + 2$

$x = 2$

OR

$\log_2 16 = x + 2$

$\log_2 16 - 2 = x$

$4 - 2 = x$

$x = 2$

Do Algebra First!

$\log_2 16 = x$

$16 = 2^x$

$2^4 = 2^x$

$x = 4$

$\log_2 16 = 4$

C12 - 8.2 - Log Restrictions Notes

State Restrictions: $\log_b a \qquad a > 0 \qquad b > 0 \qquad b \neq 1$

$logx$ $\quad x > 0$

$log\, 0 = und$

$log(-3) = und$

$\log_x \#$ $\quad x > 0, x \neq 1$

$\log_0 \# = und$

$\log_{(-2)} \# = und$

$\log_1 \# = und$

State Restrictions and Solve

Domain: Set the thing you are logging to greater than or equal to zero, then solve.

$\log_2 x = 2$ $\quad x > 0$

$x = 2^2$

$x = 4$

$\log_2(x-5) = 2$

$x - 5 = 2^2$

$x = 4 + 5$

$x = 9$

$x - 5 > 0$

$x > 5$

$\log_2(3-x) = 3$

$(3-x) = 2^3$

$3 - x = 8$

$x = -5$

$3 - x > 0$

$-x < 3$

$x < 3$

$\log_3 x^2 = 2$

$x^2 = 3^2$

$x^2 = 9$

$\sqrt{x^2} = \sqrt{9}$

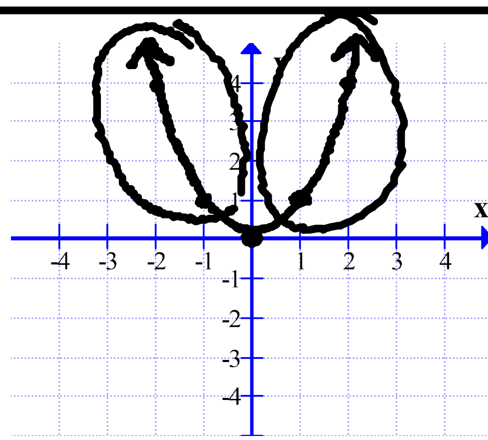
$x = \pm 3$

$x = 3$, $x = -3$

$x^2 > 0$

$x < 0, x > 0$

$x \neq 0$



$2\log_3 x = 2$ $\quad x > 0$

$\log_3 x = 1$

$x^2 = 1$

$x^2 = 9$

$\sqrt{x^2} = \sqrt{9}$

$x = \pm 3$

$x = 3$, ~~$x = -3$~~

$\log_{36}(5x - x^2) = \frac{1}{2}$

$5x - x^2 = 36^{\frac{1}{2}}$

$5x - x^2 = 6$

$x^2 - 5x + 6 = 0$

$(x-2)(x-3) = 0$

$x = 2$, $x = 3$

$5x - x^2 > 0$

$x(5-x) > 0$

$0 < x < 5$

$\log_9(x^2 - 1) = \frac{1}{2}$

$x^2 - 1 = 9^{\frac{1}{2}}$

$x^2 - 1 = 3$

$x^2 - 4 = 0$

$(x+2)(x-2) = 0$

$x = -2$, $x = 2$

$x^2 - 1 > 0$

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

$x < -1$, $x > 1$

$log_{x-3} 16 = 2$

$16 = (x-3)^2$

$16 = (x-3)(x-3)$

$16 = x^2 - 6x + 9$

$0 = x^2 - 6x - 7$

$0 = (x-7)(x+1)$

$x = 7$, ~~$x = -1$~~

$x - 3 > 0 \qquad x - 3 \neq 1$

$x > 3 \qquad x \neq 4$

Set the base of the log > 0 *and* $\neq 1$ *and solve.*

$\log_3(-x) = 2$

$-x = 3^2$

$x = -9$

C12 - 8.3 - $\log a^m = mloga$ Change Base Dist. Notes

$log5^2$ ⇕ $2log5$

$logx^2$ ⇕ $2logx$

$3log4^2$	OR	$3log4^2$
$2 \times 3log4$		$log4^{2\times3}$
$6log4$		$log4^6$
		$6log4$

Bring Exponent down in front and Vice Versa Multiply

$log\sqrt{x}$

$logx^{\frac{1}{2}}$

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

$\frac{logx}{2}$

$\log\left(\frac{1}{2}\right)$

$log2^{-1}$

$-1log2$

$-log2$

$\log_5 5^4 = x$

$5^4 = 5^x$

$x = 4$

5 to what power is 5^4

$log_5 625 = x$

$\log_5 5^4 = x$

$4\log_5 5 = x$

$4 \times 1 = x$

$x = 4$

Change of Base
Bring Exponent down in front
Log Rules

Solve

$\log_5 5 = 1$

$log_5 625 = x$

$625 = 5^x$

$5^4 = 5^x$

$x = 4$

$logxy^2 =$

$logx + logy^2 =$

$logx + 2logy$

The exponent only applies to the y value

$logx^2y^2 =$ ← $\log(xy)^2 =$

$logx^2 + logy^2 =$

$2logx + 2logy$

$2logxy =$

$2(logx + logy) =$

$2logx + 2logy$

$log3^{x+2}$

$(x + 2)\log 3$

$xlog3 + 2log3$

Bring Exponent in front

Distribute

$3xlog7 - xlog2 =$

$x(3log7 - log2)$

$GCF = x$

Change of Base

$\frac{log16}{log4} =$

$\log_4 16 = 2$

$\frac{\log_2 16}{log_2 4} =$

$\log_4 16 = 2$

Exponential Form

$16 = 4^2$

$\log_2 2 = 2$

$\log_2 16 = 4$

$\frac{4}{2} = 2$

$\log_2 4 =$

$\frac{\log_5 4}{\log_5 2}$

Choose the Base you want!

$\log_8 16 =$

$\frac{\log_2 16}{\log_2 8} = \frac{4}{3}$

$\frac{1}{\log_8 2} =$

$\frac{1}{\left(\frac{log2}{log8}\right)} =$

$1 \times \frac{log8}{log2} = \frac{log8}{log2}$

Rule 6

$\log_3 9 + \log_9 2$

$\log_{(3)^2}(9)^2 + \log_9 2$

$\log_9 81 + \log_9 2$

$\log_9 81 \times 2$

$\log_9 162$

Take the base and the log to any exponent you like!

C12 - 8.4 - $\log_b m + \log_b n = \log_b mn$ $\ log_b m - log_b n = log_b \frac{m}{n}$ $\log_{b^n} a^n$ $Notes$

$\log_2 4 + \log_2 8 =$
$\log_2 4 \times 8 =$
$\log_2 32 = \boxed{5}$

$2 + 3 = 5$

Add-Multiply

Exponential Form

$32 = 2^5$

$\log_2 4 = 2$

$\log_2 8 = 3$

$logA + \log B = logAB$

$log1 + log5 + log7 =$
$log1 \times 5 \times 7 = \log 35$

$logA + \log B + \log C = logABC$

$\log_3 27 - \log_3 3 =$
$\log_3 \frac{27}{3} =$
$\log_3 9 = 2$

$3 - 1 = 2$

Subtract-Divide

$LogA - LogB = \log\left(\frac{A}{B}\right)$

Rearrange
$-logA + logB$
$logB - logA$
$\log\left(\frac{B}{A}\right)$

$log4 + log20 - log10 =$
$log \frac{4 \times 20}{10} = log\,8$

$log5 - log2 + log10 =$
$log \frac{5 \times 10}{2} = log25$

$log5 - log2 - log10 =$
$log \frac{5}{2 \times 10} = \log \frac{1}{4}$

Positives on top,
Negatives on Bottom
Vice Versa

$LogA + LogB - LogC = \log\left(\frac{AB}{C}\right)$

$LogA - LogB - LogC = Log\left(\frac{A}{BC}\right)$

$Log\left(\frac{A}{BC}\right) = LogA - LogBC$
$Log\left(\frac{A}{BC}\right) = LogA - (LogB + LogC)$
$Log\left(\frac{A}{BC}\right) = LogA - LogB - LogC$

$logx + \log x =$
$\log x \times x = \log x^2$

$\log 3 + \log(x+1) =$
$log3(x+1) = \log(3x+3)$

$\log(x-2) + \log(x+1) =$
$\log(x-2)(x+1) = \log(x^2 - x - 2)$

Add Multiply

$\log x^3 - \log x^2 =$
$\log \frac{x^3}{x^2} = logx$

$\log(x^2 - 1) - \log(x+1) =$
$\log \frac{x^2 - 1}{x+1} =$
$\log \frac{(x+1)(x-1)}{(x+1)} = \log(x-1)$

Subtract
Divide
Factor
Simplify

$\log_2 8 =$
$\log_{2^2} 8^2 =$
$\log_4 64 = 3$

Take the base and the log to any exponent you like!

Exponential Form

$64 = 4^3$

$\log_2 8 = 3$

$8 = 2^3$

$\log_4 16 =$
$\log_{\sqrt{4}} \sqrt{16} =$
$\log_2 4 = 2$

$\log_{\frac{1}{2}} 4 =$
$\log_{(\frac{1}{2})^{-1}} 4^{-1} =$
$\log_2 4^{-1} =$
$-1 \log_2 4 = -2$

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

$\log_2 4 = 2$

$-1 \times 2 = -2$

$\log_2 4 + \log_4 2 =$
$\log_{2^2} 4^2 + \log_4 2 =$
$\log_4 16 + \log_4 2 =$
$\log_4 32 \times 2 =$
$\log_4 64 = 3$

Take the base and the thing you are logging to an exponent to get like bases.

C12 - 8.4 - $log5 = m, log7 = n, Notes$

$Given:$ $log5 = m$ $log7 = n$ $Solve\ in\ terms\ of\ m\ and\ n:$

$log25 = log5^2$
$= 2log5$
$= 2m$

$log35 = log5 + log7$
$= m + n$

$log350 = log5 + log7 + log10$
$= m + n + 1$

$log5x = log5 + logx$
$= m + logx$

$log0.49 = \log\frac{49}{100}$
$= log49 - log100$
$= log7^2 - 2$
$= 2log7 - 2$
$= 2n - 2$

$\log_5 7 = \frac{log7}{log5}$
$= \frac{n}{m}$

$Given:$ $log4 = a$ $log6 = b$ $Solve\ in\ terms\ of\ a\ and\ b:$

$log16 =$
$log4^2 =$
$2log4 =$
$2a$

$log16 =$
$log2^4 =$
$4log2 =$
$4a$

$log24 =$
$log6 + log4 =$
$\frac{b}{2} + \frac{a}{2}$

$log2 =$
$log\sqrt{4} =$
$log4^{\frac{1}{2}} =$
$\frac{1}{2}log4 =$
$\frac{1}{2}a$

$log3 =$
$\log\frac{6}{2} =$
$log6 - log2 =$
$b - \frac{1}{2}a$

$\log\frac{3}{2} =$
$log3 - log2 =$
$b - \frac{1}{2}a - \frac{1}{2}a =$
$b - a$

$log0.4 =$
$\log\left(\frac{4}{10}\right) =$
$log4 - log10 =$
$a - 1$

C12 - 8.5 - De/Log Operation/Equation/Factoring Notes

$log8 = 0.9031$ $\qquad$ $log_4 7 = 1.4037$

Calculator: Math, Alpha, Math

$\log_5(x+1) = \log_5 7$ — Delog both sides

$\log_5(x+1) = \log_5 7$

$x + 1 = 7$

$x = 6$ ✓

$\log_2(x-2) + \log_2(x+1) = 2$

$\log_2(x-2)(x+1) = 2$

$\log_2(x^2 - x - 2) = 2$

$x^2 - x - 2 = 2^2$

$x^2 - x - 2 = 4$

$x^2 - x - 6 = 0$

$(x-3)(x+2) = 0$

✓ $x = 3$ $\qquad$ ~~$x = -2$~~

$\log_2(x-2) + \log_2(x+1) = 2$

$\log_2(x^2 - x - 2) = \log_2 4$

$x^2 - x - 2 = 4$

$x^2 - x - 6 = 0$

See Left

Or Turn a number into a log!

$2 = \log_2 m$

$2^2 = m$

$m = 4$

$2 = \log_2 4$

$\log_2(x-2) - 2 = \log_2(x+1)$

$\log_2(x-2) + \log_2(x+1) = 2$ — Algebra

See Above

$x - 2 > 0$ $\qquad$ $x - 1 > 0$

$x > 2$ $\qquad$ ~~$x > -1$~~

Reject Redundant!

$\log_3(x-11) - \log_3(x-3) = 2$

$\log_3 \dfrac{x-11}{x-3} = 2$

$\dfrac{x-11}{x-3} = 3^2$

$\dfrac{x-11}{x-3} = 9$

$x - 11 = 9(x-3)$

$x - 11 = 9x - 27$

$16 = 8x$

$x = 2$ $\qquad$ $x > 3$

$2\log_5 x + \log_5 x = 3$

$\log_5 x^2 + \log_5 x = 3$

$\log_5 x^2 \times x = 3$

$\log_5 x^3 = 3$

$x^3 = 5^3$

$x = 5$ $\qquad$ $x > 0$

Must Bring exponents up 1st!

$(logx)^2 - logx^3 = 4$

$(logx)^2 - 3logx = 4$

$m^2 - 3m - 4 = 0$

$(m-4)(m+1) = 0$

$let\ m = logx$

$m = 4$ $\qquad$ $m = -1$

$logx = 4$ $\qquad$ $logx = -1$

✓ $x = 10^4$ $\qquad$ $x = 10^{-1}$ ✓

C12 - 8.6 - Log Both Sides Notes

$$4 = 2^x$$
$$log4 = log2^x$$
$$log4 = xlog2$$
$$\frac{log4}{log2} = x$$
$$\log_2 4 = x$$
$$x = 2$$

Log Both Sides
Bring Exponents Down In Front
Divide
Change of base

Definition
Solve

$$3 = 5^x$$
$$log3 = log5^x$$
$$log3 = xlog5$$
$$\frac{log3}{log5} = x$$
$$\log_5 3 = x$$
$$x = 0.6826$$

Algebraic answer

Check Answer:
$$5^{0.6828} = 3$$

Before you log both sides!

$$3 = 2^x - 1$$
$$4 = 2^x$$

Add/Subtract First

$$8 = 2 \times 2^x$$
$$4 = 2^x$$

Divide First

Or

$$8 = 2 \times 2^x$$
$$log8 = \log(2 \times 2^x)$$
$$log8 = log2 + log2^x$$

$$4 = 7^{2x+1}$$
$$log4 = log7^{2x+1}$$
$$log4 = (2x+1)log7$$
$$log4 = 2xlog7 + \log 7$$
$$log4 - log7 = 2xlog7$$
$$\frac{log4 - log7}{2log7} = x$$
$$x = \frac{log4 - log7}{2log7}$$
$$x = -0.29$$

Distribute
Combine x's on one side
Everything else on other side
Factor out x
Divide

$$4 = 7^{2x+1}$$
$$\log_7 4 = 2x + 1$$
$$\log_7 4 - 1 = 2x$$
$$x = \frac{\log_7 4 - 1}{2}$$

$$2^{2x-5} = 9^{x+2}$$
$$log2^{2x-5} = log9^{x+2}$$
$$(2x-5)log2 = (x+2)log9$$
$$2xlog2 - 5log2 = xlog9 + 2log9$$
$$2xlog2 - xlog9 = 2log9 + 5log2$$
$$x(2log2 - log9) = 2log9 + 5log2$$
$$x = \frac{2log9 + 5log2}{2log2 - log9}$$

$$6 \times 3^x = 14^{2x-5}$$
$$log6 \times 3^x = log14^{2x-5}$$
$$log6 + log3^x = log14^{2x-5}$$
$$log6 + xlog3 = (2x-5)log14$$
$$log6 + xlog3 = 2xlog14 - 5log14$$
$$2xlog14 - xlog3 = log6 + 5log14$$
$$x(2log14 - log3) = log6 + 5log14$$
$$x = \frac{log6 - log15}{2log14 - log3}$$

Rule 7 Proof

$$b^{\log_b x} = x$$

$$b^{\log_b x} = x$$
$$\log b^{\log_b x} = logx$$
$$\log_b x \log(b) = logx$$
$$\frac{\log_b x \log(b)}{logb} = \frac{logx}{\log b}$$
$$\log_b x = \frac{logx}{logb}$$
$$\log_b x = \log_b x$$
$$x = x$$

Remember: You may only log both sides if SAMD is complete. Bedmas backwards.
Remember: If you do log a product you must separate into an addition of logs.
Remember: If you log a sum you must use brackets
Remember: You may only de-log both sides if one log equals one log.

C12 - 8.6 - Word Problem Notes

How long to earn \$1500 on \$10000 at 10%/year?

$$F = P(1+r)^t$$
$$11500 = 10000(1+0.1)^t$$
$$\frac{11500}{10000} = 1.1^t$$
$$1.15 = 1.1^t$$
$$log1.15 = log1.1^t$$
$$log1.15 = tlog1.1$$
$$\frac{log1.15}{log1.1} = t$$
$$\log_{1.1} 1.15 = t$$
$$t = 1.47\ years$$

10000
+1500
11500

Logic

$$1.15 = 1.1^t$$
$$\log_{1.1} 1.15 = t$$

How long to grow \$10000 to \$12000 compounded quarterly at 10%?

$$F = P\left(1+\frac{r}{n}\right)^{tn}$$
$$12000 = 10000\left(1+\frac{0.1}{4}\right)^{4t}$$
$$1.2 = 1.025^{4t}$$
$$\log_{1.025} 1.2 = 4t$$
$$\frac{\log_{1.025} 1.2}{4} = t$$
$$t = 1.85\ years$$

Find the half-life of a substance decaying to 20% of its original in 500 years?

$$F = P(r)^{\frac{t}{T}}$$
$$20 = 100\left(\frac{1}{2}\right)^{\frac{500}{T}}$$
$$0.2 = 0.5^{\frac{500}{T}}$$
$$\log_{0.5} 0.2 = \frac{500}{T}$$
$$T = \frac{500}{\log_{0.5} 0.2}$$

Cross Multiply

$$T = 215.34\ years$$

Find the number of compounding periods to grow \$10000 to \$16288.95 at 10% in 5 years.

$$F = P\left(1+\frac{r}{n}\right)^{tn}$$
$$2 = 1\left(1+\frac{0.1}{n}\right)^{5n}$$

$y_1 = y_2$
Find Intersection

$$n = 2\quad ; Semi-annually$$

How long to triple your money at 10%/year?

$$F = P(1+r)^t$$
$$3 = 1(1+0.1)^t$$
$$3 = 1.1^t$$
$$\log_{1.1} 3 = t$$
$$t = 11.43\ years$$

$P = 1$
$\rightarrow$
$F = 3$

An earthquake of magnitude 8 is 250 times as intense as an earth quake of what magnitude?

$$I = 10^{b-s}$$
$$250 = 10^{8-s}$$
$$\log_{10} 250 = 8 - s$$
$$s = 5.6\ magnitude$$

How long to grow 1000 Bacteria to 5000 at a continuous growth rate of 0.05?

$$F = Pe^{kt}$$
$$5000 = 1000e^{0.05t}$$
$$5 = e^{0.05t}$$
$$\frac{\ln_e 5}{0.05} = t$$
$$t = 32.2 \ldots$$

A substance has a half-life of 5 years. How long to be ten percent of its original?

$$F = P(r)^{\frac{t}{T}}$$
$$10 = 100\left(\frac{1}{2}\right)^{\frac{t}{5}}$$
$$0.1 = 0.5^{\frac{t}{5}}$$
$$\log_{0.5} 0.1 = \frac{t}{5}$$
$$t = 16.61\ years$$

C12 - 8.7 - Graph Log Notes

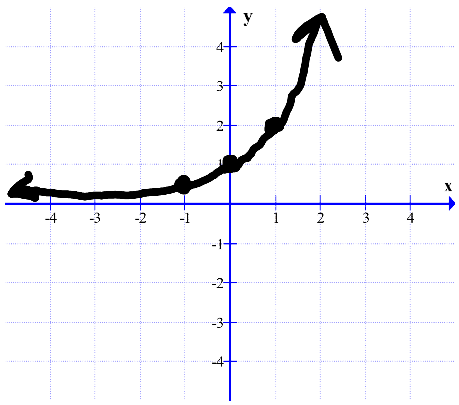
Graph: $y = \log_2 x$

$y = 2^x$

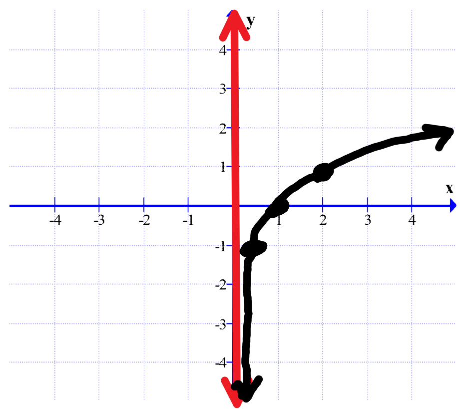
x	y
-1	$\frac{1}{2}$
0	1
1	2

x	y
$\frac{1}{2}$	-1
1	0
2	1

$y = 2^x$



$x <-> y$



$y = \log_2 x$

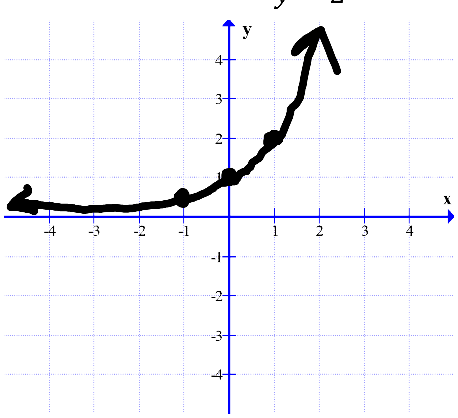
VA: $x = 0$ $Domain$: $x \geq 0$

Graph: $y = \log_2(x + 2) + 1$

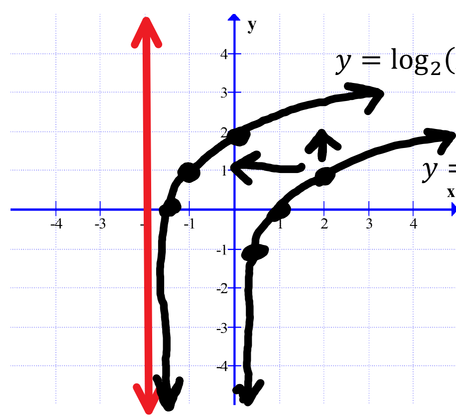
$y = 2^x$

$Left\ 2$
$Up\ 1$

$y = 2^x$



$x <-> y$



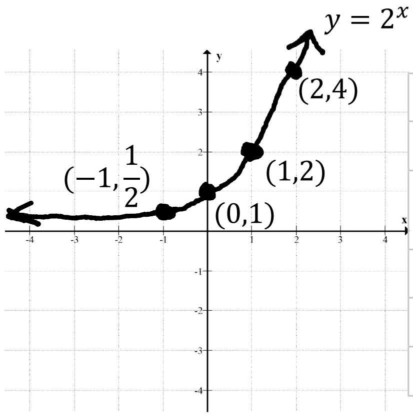
$y = \log_2(x + 2) + 1$

$y = \log_2 x$

$x + 2 = 0$
$x = -2$
VA

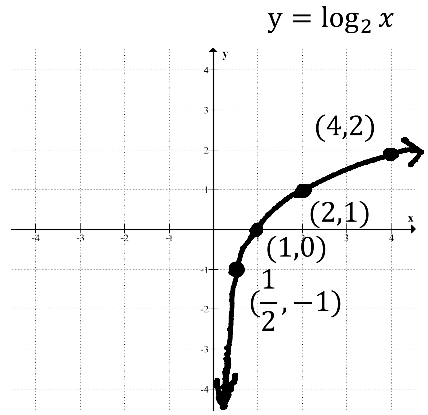
$x + 2 > 0$
$x > -2$
Domain

C12 - 8.8 - Inverse Log Graphs Notes



x	y
-1	$\frac{1}{2}$
0	1
1	2
2	4

x	y
0	*und*
$\frac{1}{2}$	-1
1	0
2	1
2	4

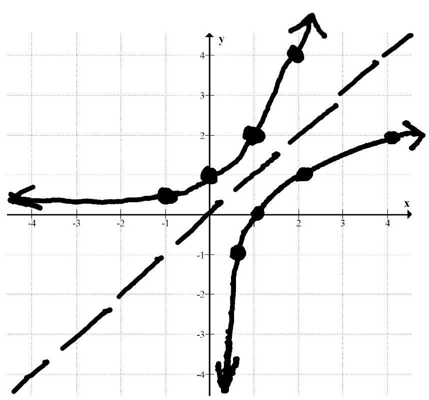


$y = 2^x$	
$x = 2^y$	*Switch x and y*
$logx = log2^y$	Log Both Sides
$logx = ylog2$	Bring Exponents Down In Front
$\frac{logx}{log2} = y$	Divide
$\log_2 x = y$	Change of base
$y = \log_2 x$	Mirror
$f^{-1}(x) = \log_2 x$	Inverse Function notation

$y = 2^x$	
$x = 2^y$	*Switch x and y*
$y = \log_2 x$	Exponential to log Form
$f^{-1}(x) = \log_2 x$	

Back the Other Way!

$$y = \log_2 x$$
$$x = \log_2 y$$
$$2^x = y$$
$$y = 2^x$$
$$f^{-1}(x) = 2^x$$



Remember: Inverse: Switch x and y
Remember: A diagonal reflection over the line $y = x$

Inverse Proof

$$y = 2^{x+1} - 3$$
$$x = 2^{y+1} - 3$$
$$x + 3 = 2^{y+1}$$
$$\log(x+3) = (y+1)log2$$
$$\frac{\log(x+3)}{log2} = y + 1$$
$$\log_2(x+3) = y + 1$$
$$\log_2(x+3) - 1 = y$$
$$y = \log_2(x+3) - 1$$
$$f^{-1}(x) = \log_2(x+3)$$

$$y = \log_2(x+3) - 1$$
$$x = \log_2(y+3) - 1$$
$$x + 1 = \log_2(y+3)$$
$$2^{x+1} = y + 3$$
$$2^{x+1} - 3 = y$$
$$y = 2^{x+1} - 3$$
$$f^{-1}(x) = 2^{x+1} - 3$$