

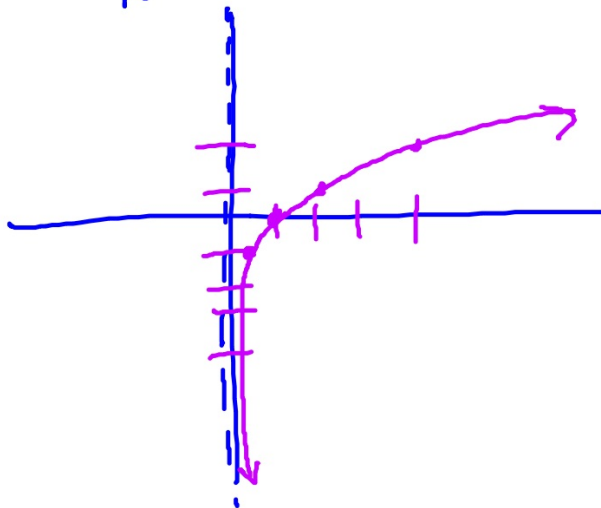
Logs/Exponentials Review

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

$$D: (0, \infty)$$
$$R: (-\infty, \infty)$$

$$\log 1 = 0$$
$$\log_2 2 = 1$$

x	y
1/2	$\log_2 1/2 = -1$
1	0
2	$\log_2 2 = 1$
4	$\log_2 4 = 2$



$$g(x) = \log_3(x-1) + 2$$

$$D: x-1 > 0 \\ x > 1$$

$$VA: x=1$$

$$D = \log_3(x-1) + 2$$

$$-2 = \log_3(x-1)$$

$$3^{-2} = x-1$$

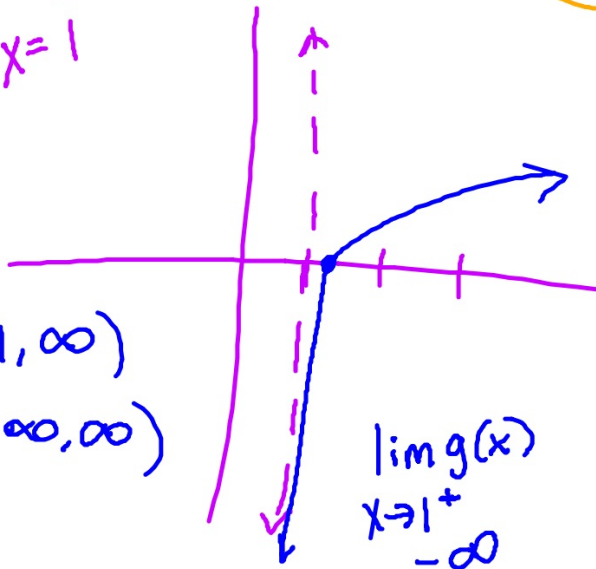
$$\frac{1}{9} = x-1$$

$$\frac{1}{9} + 1 = x$$

$$D: (1, \infty)$$

$$R: (-\infty, \infty)$$

$$\lim_{x \rightarrow 1^+} g(x) = -\infty$$



$$2^x = 16$$
$$\log_2 16$$
$$4$$

$$\log_5 1$$
$$0$$
$$5^0 = 1$$

$$\log_3 \frac{1}{27}$$
$$-3$$

$$\log_7 7$$
$$1$$

$$\ln e$$
$$1$$

$$\ln 1$$
$$0$$
$$e^0 = 1$$

$$\ln x = \log_e x$$

Log Properties

$$\log(ab) = \log a + \log b$$

$$\log\left(\frac{a}{b}\right) = \log a - \log b$$

$$\log a^b = b \log a$$

$$\ln 2 \approx .693 \quad \ln 3 \approx 1.099$$

$$\ln 6 = \ln(2 \cdot 3) = \ln 2 + \ln 3 = .693 + 1.099 = 1.792$$

$$\ln 9 = \ln 3^2 = 2 \ln 3 = 2(1.099) = 2.198$$

$$\ln 1.5 = \ln \frac{3}{2} = \ln 3 - \ln 2 = 1.099 - .693 = .406$$

$$\ln \sqrt{3} = \ln 3^{1/2} = \frac{1}{2} \ln 3 = \frac{1}{2}(1.099) = .5495$$

Expand.

$$\begin{aligned} \textcircled{1} \log_4 \left(\frac{x}{yz} \right)^2 &= 2 \log_4 \left(\frac{x}{yz} \right) \\ &= 2 \left[\log_4 x - (\log_4 y + \log_4 z) \right] \\ &= 2 \log_4 x - 2 \log_4 y - 2 \log_4 z \end{aligned}$$

Expand

$$\textcircled{2} \log_2 X^2 \sqrt{X^3 - 1}$$

$$\log_2 X^2 (X^3 - 1)^{1/2}$$

$$\log_2 X^2 + \log_2 (X^3 - 1)^{1/2}$$

$$2\log_2 X + \frac{1}{2}\log_2 (X^3 - 1)$$

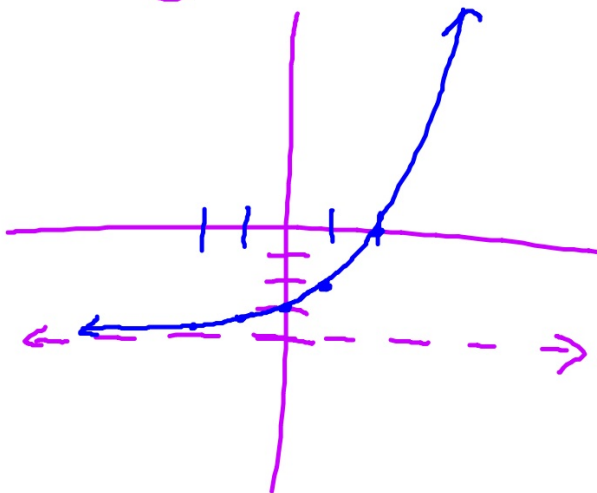
Condense

$$\textcircled{1} 3\log x - 4\log y + 7\log z$$

$$\log\left(\frac{x^3 z^7}{y^4}\right)$$

Exponential Graphs

$$y = 2^x - 4$$



$$D: (-\infty, \infty)$$
$$R: (-4, \infty)$$

x	y
-2	$\frac{1}{4} - 4 = -3\frac{3}{4}$
-1	$\frac{1}{2} - 4 = -3\frac{1}{2}$
0	-3
1	-2
2	0

Solve.

$$\textcircled{1} 2e^{4x} - 1 = 17$$

$$\ln(e^{4x}) = \ln(9)$$

$$4x \cdot \overset{(1)}{\ln e} = \ln 9$$

$$4x = \ln 9$$

$$x = \frac{\ln 9}{4}$$

$$\textcircled{2} \log_2 \sqrt{x-1} = 4$$

$$\sqrt{x-1}^2 = 16^2$$

$$x-1 = 256$$

$$x = 257$$

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

$$\log_2 (x-1) = 8$$

$$x-1 = 256$$

$$\textcircled{3} \log_2 x + \log_2 (x+2) = 3$$

$$\log_2 x(x+2) = 3$$

$$2^3 = x^2 + 2x$$

$$0 = x^2 + 2x - 8$$

$$0 = (x+4)(x-2)$$

$$\cancel{x=4} \quad x=2$$

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$$3 + 4^{x-1} = 15$$

$$\log(4^{x-1}) = \log(12)$$

$$(x-1)\log 4 = \log 12$$

$$x-1 = \frac{\log 12}{\log 4}$$

$$x = \frac{\log 12}{\log 4} + 1 = \log_4 12 + 1$$

$$\frac{\log 12}{\log 4} \neq \log 3$$

$$\log_a b = \frac{\log b}{\log a}$$