

GRAPHING LOGS

$y = 2^{x+3} - 1$ *left + 3 down 1*

$y = \log_2(x+3) - 1$

0	1
1	2
2	4
3	8

1	0
2	1
4	2
8	3

3 8 $10^5 = 100,000$

$y = -3^{x-2} + 9$

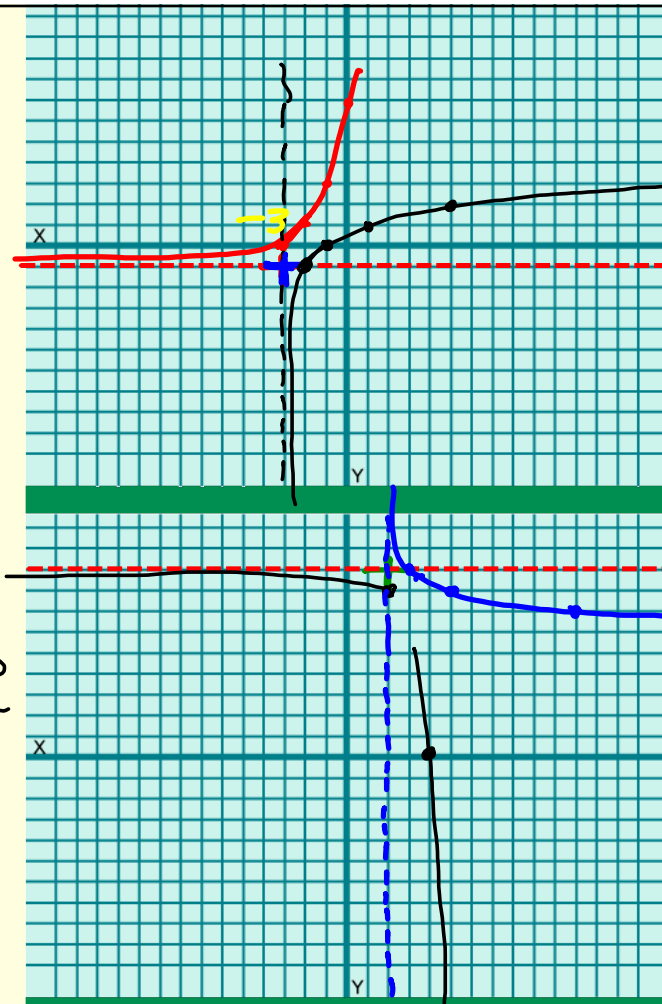
$y = -\log_3(x-2) + 9$
Right UP 9

0	1
1	3
2	9
3	27

$y = \log x$

$y = \log(-x)$

1	0
3	1
9	2



LOG OPERATIONS

$$\log_{10} 10^7 = 7 \quad \ln e^{217} = 217 \quad \underline{6^{\log_6 39} = 39}$$

Solve. $\log_5 x = 4$

Exponentiate

$$5^{\log_5 x} = 5^4$$

$$\boxed{x = 625}$$

$$y = b^x$$

$b > 0, b \neq 1$

Logs must
Contain positive
values!

$$\log_a 64 = 2$$

argument

$$a^{\log_a 64} = a^2$$

$$\sqrt{64} = \sqrt{a^2}$$

$$\pm 8 = a$$

$$\log_{25} \sqrt[4]{5} = x$$

$$25^{\log_{25} \sqrt[4]{5}} = 25^x$$

$$\sqrt[4]{5} = 25^x$$

$$5^{1/4} = 5^{2x}$$

$$\frac{1}{2} \cdot \frac{1}{4} = 2x \cdot \frac{1}{2}$$

$$\boxed{\frac{1}{8} = x}$$

PROPERTIES OF LOGARITHMS

$$\log_b m + \log_b n = \log_b (mn)$$

$$\log_b m - \log_b n = \log_b \left(\frac{m}{n}\right)$$

$$\log_b m^p = p \log_b m$$

$$\log_2 4 + \log_2 8 = \log_2 32$$

$$\log_2 2^2 + \log_2 2^3 = \log_2 2^5$$

$$2 + 3 = 5$$

$$\log_7 7^5 = 5 \log_7 7$$

$$5 = 5 \cdot 1$$

$$\log_7 (x+5) + \log_7 (x-3) = 2 \log_7 3$$

1) Need 1 log on each side

$$\log_7 \left(\frac{(x+5)(x-3)}{x^2 + 2x - 15} \right) = \log_7 3^2$$

2) Exponentiate!

$$7^{\log_7 (x^2 + 2x - 15)} = 7^{\log_7 9}$$

$$x^2 + 2x - 15 = 9$$

$$x^2 + 2x - 24 = 0$$

$$(x+6)(x-4) = 0$$

$$\cancel{x = -6} \quad x = 4$$

$$\ln 4x + \ln 3 - \ln 6 = 3 \ln 4$$

$$\ln \left(\frac{4x \cdot 3}{6} \right) = \ln 4^3$$

$$\ln 2x = \ln 64$$

$$2x = 64$$

$$\boxed{x = 32}$$

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

$$\log \left(\frac{x}{x+3} \right) = 1$$

$$10^{\log_{10} \left(\frac{x}{x+3} \right)} = 10^1$$

$$(x+3) \left[\frac{x}{x+3} = \frac{10}{1} \right]$$

$$x = 10x + 30$$

$$-\frac{30}{9} = \frac{9x}{9}$$

~~$$\frac{-10}{3} = x$$~~

No solution

$$8^{x-2} = 117$$

$$\log 8^{x-2} = \log 117$$

$$\frac{(x-2)\log 8}{\log 8} = \frac{\log 117}{\log 8}$$

$$x-2 = \frac{\log 117}{\log 8}$$

$$x = \frac{\log 117}{\log 8} + 2$$

$$\approx 4.29$$

Log + Plog!

- 1) Add logs to both sides
- 2) Plog exponent down front
- 3) Solve for x.

$$\frac{7e^{3x+5}}{7} = \frac{14}{7}$$

$$e^{3x+5} = 2$$

$$\ln e^{3x+5} = \ln 2$$

$$3x+5 = \ln(2)$$

$$\frac{3x}{3} = \frac{\ln(2) - 5}{3}$$

$$x = -1.44$$

$$4/ \quad \cancel{2} \ln 6^2 - \frac{1}{2} \ln 81^{\sqrt{81}} = \cancel{2} \ln x^2$$
$$\ln 36 - \ln 9 = \ln x^2$$