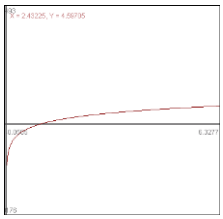
Exponential Function: $y = a^x$ If $a \neq 1$

- the function is one-to-one and has an inverse

$$y = a^x \iff x = a^y$$

$y = \log_a x$

Vertical Asymptote x = 0



Domain: $(0, \infty)$

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

Properties of Logs

1) Product Rule: $\log_a(xy) = \log_a x + \log_a y$

2) Quotient Rule: $\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$

3) Power Rule: $\log_a(x^y) = y \log_a x$

4) Property of Equality: $\log_a x = \log_a y$ then $x = y$

Solve:

1) $\log_3 270 - \log_3 10$

$\log_3\left(\frac{270}{10}\right) = x$

$\log_3(27) = x$

$3^x = 27$

$x = 3$

Rewrite using a single logarithm.

2) $\log_2 4 + \log_2 6 - 3\log_2 4$

$\log_2(4 * 6) - \log_2 4^3$

$\log_2(24) - \log_2(64)$

$\log_2\left(\frac{24}{64}\right)$

$\log_2\left(\frac{3}{8}\right)$

Common logarithms.

log x means $\log_{10} x$ (base 10)

Natural logs (*ln)* - logs with base e

ln x means $\log_e x$

Other Properties

1)	$\log_a a = 1$	$\log_3 3 = x$	$3^x = 3$	$x = 1$
2)	ln e = 1	$\log_e e = x$	$e^x = e$	$x = 1$
3)	$a^{\log_a x} = x$	$7^{\log_7 64} = x$	$(\log_7 64)(\log_7 7) = \log_7 x$ $(\log_7 64) = \log_7 x$ x = 64	
4)	$e^{\ln x} = x$	$e^{\ln 2} = x$ $e^{\log_e 2} = x$ $\log_e x = \log_e 2$ $x = 2$		
5)	$\ln e^x = x$	$\ln e^4 = x$ $4 \ln e = x$ $4(1) = x$ $4 = x$		