PRECALCULUS NAME: Alexandra Jones

GPS # 28 **3.2** **LOGARITHMIC FUNCTIONS II** Class Time: 11:30-12:45 Date: 3/6/08

Useful Guidelines:

* The logarithmic function to the base a, where $a > 0$ and $a \neq 1$: $y = \log_a x$ if and only if $x = a^y$;
* Properties of the logarithmic Function $y = \log_a x$ (where $a > 0$ and $a \neq 1$):
  (1) Domain: the interval $(0, \infty)$; Range: the interval $(-\infty, \infty)$;
  (2) x-intercepts: 1; y-intercept: none;
  (3) Vertical asymptote: $x = 0$;
  (4) $f(x) = \log_a x, a > 1$, is an increasing, one-to-one, smooth and continuous function;
  $f(x) = \log_a x, 0 < a < 1$, is a decreasing, one-to-one, smooth and continuous function;
  (5) The points $(1,0), (a,1)$, and $(\frac{1}{a}, -1)$ are always on the graph of f.
* Natural logarithm function: $y = \log_e x = \ln x$ if and only if $x = e^y$.
* Common logarithm function: $y = \log x$ if and only if $x = 10^y$.

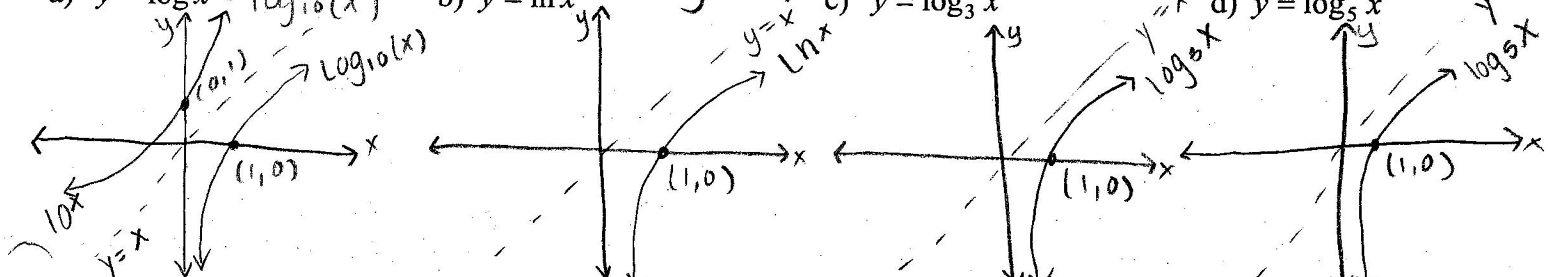
no Grph no ~~Info~~

$y = \log_a x$

$a^y = x$

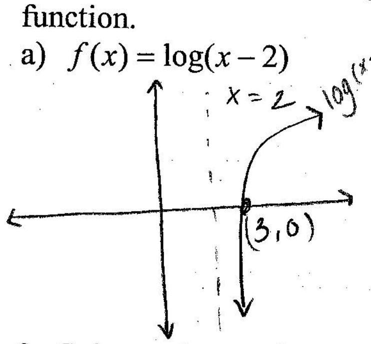
1. Graph each logarithmic function.

a) $y = \log x = \log_{10}(x)$ b) $y = \ln x = \log_e(x)$ c) $y = \log_3 x$ d) $y = \log_5 x$



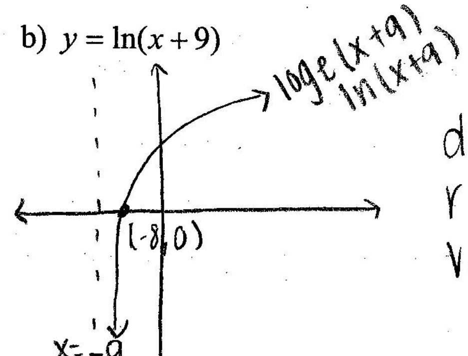
2. Use transformations to graph each function. Determine the domain, range, and vertical asymptote of each function.

a) $f(x) = \log(x-2)$



d: $(2, \infty)$
r: $(-\infty, \infty)$
va: $x=2$

b) $y = \ln(x+9)$



d: $(-9, \infty)$
r: $(-\infty, \infty)$
va: $x = -9$

3. Solve each equation.

a) $\log_3 x = 4$

$x = (3)^4$
$x = 81$

b) $\log_5(x+1) = 2$

$x+1 = (5)^2$
$x+1 = 25$
$x = 24$

c) $\ln x = 3$

$\log e(x) = 3$
$x = e^3$

d) $\ln e^x = 4$

$\log e(e^x)$
$e^x = e^4$ $x = 4$

e) $e^{2x} = 5$

$\log e(e^{2x}) = \log e(5)$
$2x \log e(e) = \log e(5)$
$2x = \log e(5)$ $2x = \ln(5)$ $x = \frac{1}{2}\ln(5)$

f) $e^{-3x} = 10$

$\log e(e^{-3x}) = \log e(10)$
$-3x = \ln(10) \Rightarrow x = -\frac{1}{3}\ln(10)$