**PRECALCULUS**

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**GPS # 28** **3.2** **LOGARITHMIC FUNCTIONS II**

Class Time: T/Th 11:30 Date: 3-6-08

20/20 Good Job!

**Useful Guidelines:**

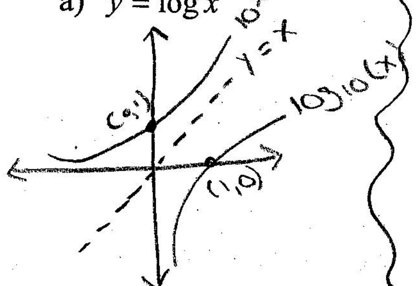
* The logarithmic function to the base $a$, where $a > 0$ and $a \neq 1$: $y = \log_a x$ if and only if $x = a^y$;
* Properties of the logarithmic Function $y = \log_a x$ (where $a > 0$ and $a \neq 1$):
  (1) Domain: the interval $(0, \infty)$; Range: the interval $(-\infty, \infty)$;
  (2) $x$-intercepts: 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 $x = 10^y$.

$Y = \log_a(x)$

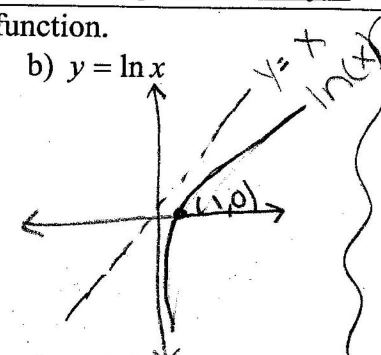
$a^Y = X$

1. Graph each logarithmic function.

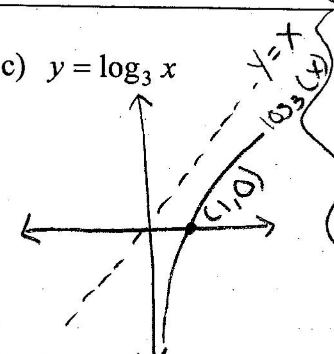
a) $y = \log x$



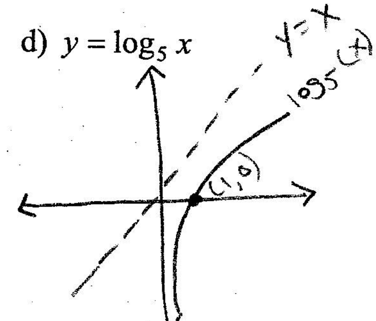

b) $y = \ln x$




c) $y = \log_3 x$

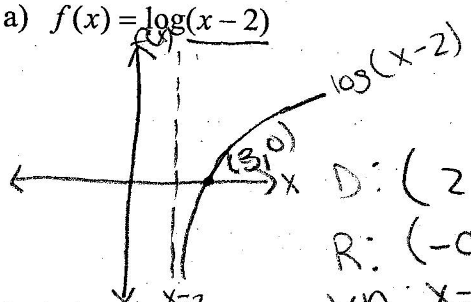



d) $y = \log_5 x$



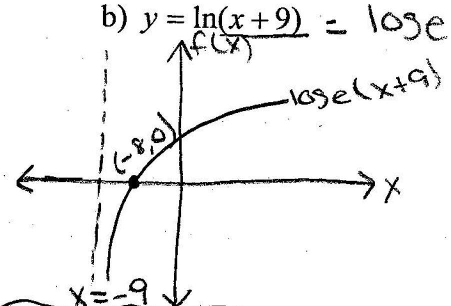

2. Use transformations to graph each function. Determine the domain, range, and vertical asymptote of each function.

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




D: $(2, \infty)$
R: $(-\infty, \infty)$
VA: $X = 2$

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




D: $(-9, \infty)$
R: $(-\infty, \infty)$
VA: $X = -9$

3. Solve each equation.

a) $\log_3 x = 4$

$X = 3^4$

$X = 81$

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

$\log(x+1) = 5^2$

$X = 25 - 1$

$X = 24$

c) $\ln x = 3$

$X = e^3$

d) $\ln e^x = 4$

$x \ln(e) = 4$ $\qquad \ln(e) = 1$, $\log_e(e) = 1$

$x(1) = 4$

$X = 4$

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

$e^{2x} = 5$

$2x \log_e(e) = \log_e(5)$

$2x \cdot 1 = \ln(5)$

$X = \frac{1}{2}\ln(5)$

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

$-3x \log_e(e) = \log_e(10)$

$\frac{-3x \cdot 1}{-3} = \frac{\ln(10)}{-3}$

$X = -\frac{1}{3}\ln(10)$