LOGARITHMS

$\log_2 8$ is the exponent we need to raise 2 to get 8

$\log_2 8 = 3$ because $2^3 = 8$

$\log_{10} 100 = 2$? $10^2 = 100$

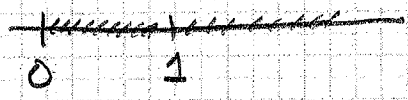
$e \approx 2.718\ldots$

$\log_{10} x = \log x$ = Common Logs

$\log_e x = \ln x$ = Natural logs

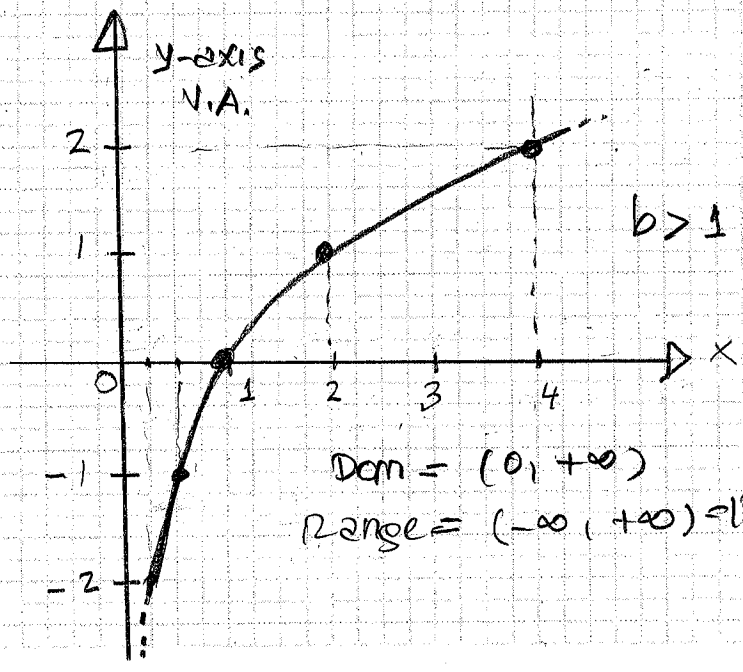
LOGARITHMIC FUNCTIONS

$f(x) = \log_b x$ $\quad b \neq 1$, $b > 0$



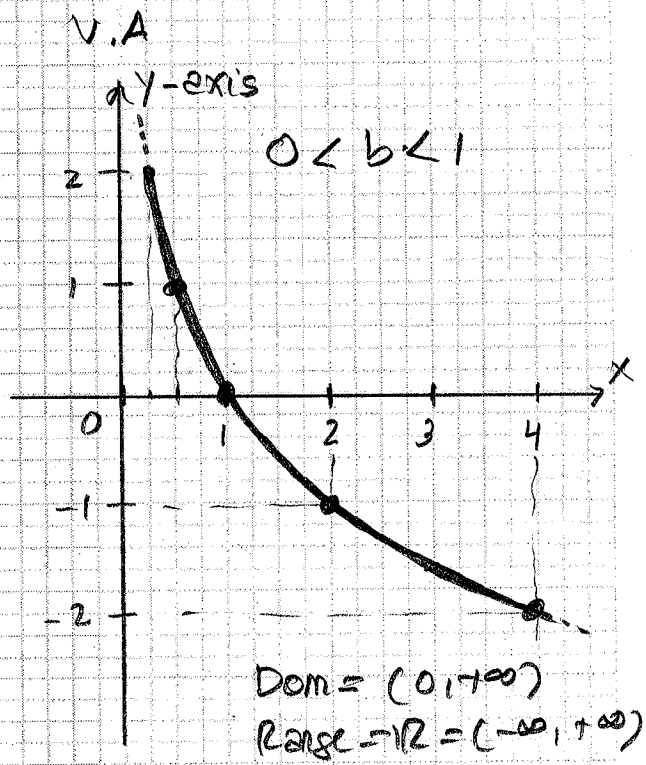
ex: $f(x) = \log_2 x$

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



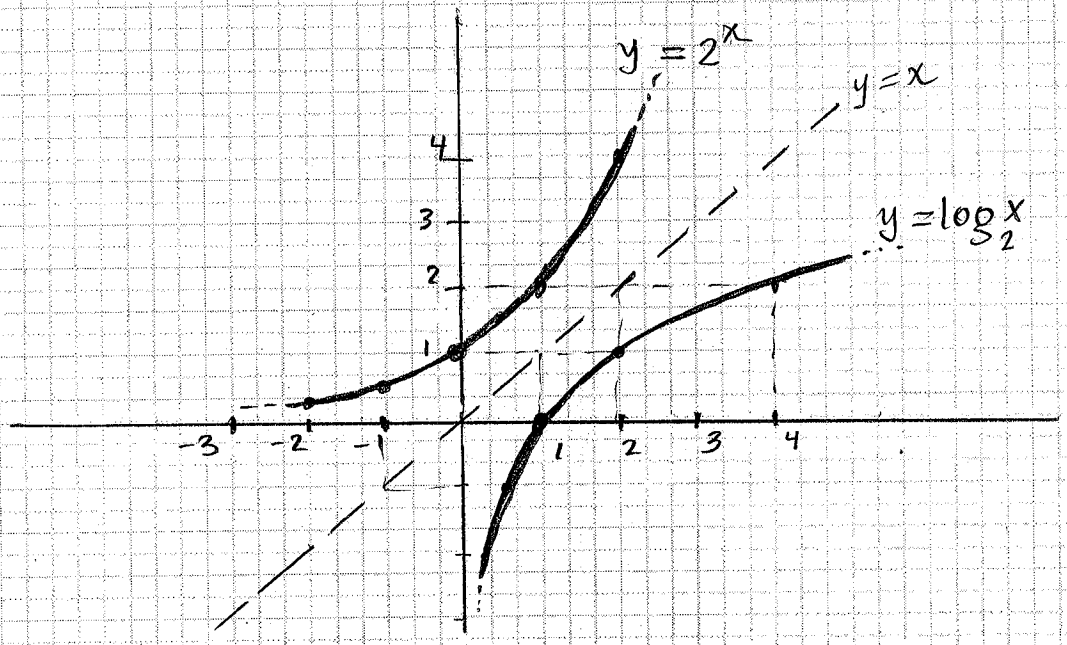
ex: $f(x) = \log_{1/2} x$

x	$\log_{1/2} x$
$1/4$	$\log_{1/2}(1/4) = 2$
$1/2$	$\log_{1/2}(1/2) = 1$
1	$\log_{1/2}(1) = 0$
2	$\log_{1/2} 2 = -1$
4	$\log_{1/2} 4 = -2$



$$\left(\frac{1}{2}\right)^{-1} = \frac{1}{\left(\frac{1}{2}\right)^1} = \frac{1}{1/2} = 1 \cdot \frac{2}{1} = 2$$

$$\left(\frac{1}{2}\right)^{-2} = \frac{1}{\left(\frac{1}{2}\right)^2} = \frac{1}{\frac{1}{4}} = 1 \cdot \frac{4}{1} = 4$$



$(f \circ g)(x) = x$ $\quad$ $(g \circ f)(x) = x$

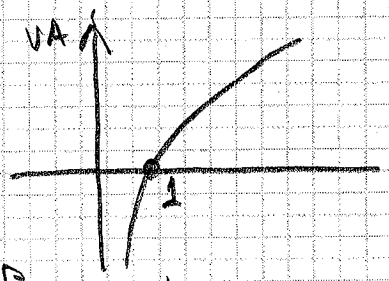
$f(x) = b^x$ $\quad$ $g(x) = \log_b x$

$(f \circ g)(x) = f(g(x)) = f(\log_b x) = b^{\log_b x} = x$

$(g \circ f)(x) = g(f(x)) = g(b^x) = \log_b b^x = x$

TRANSFORMATIONS: Use transformations to graph the following functions

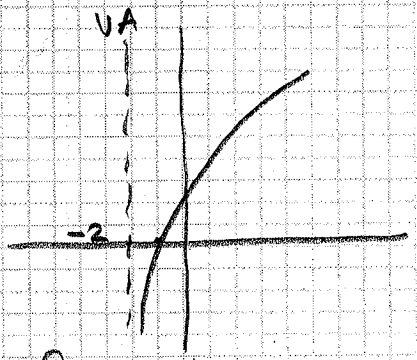
1) $f(x) = \ln(x+2)$



$f(x) = \ln x$

Domain $= (0, +\infty)$

VA: $x = 0$



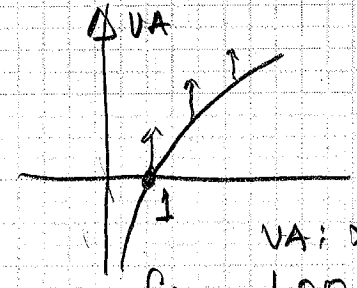
$f(x) = \ln(x+2)$

shift to the left

Domain $= (2, +\infty)$

VA: $x = -2$

2) $f(x) = \log x + 2$

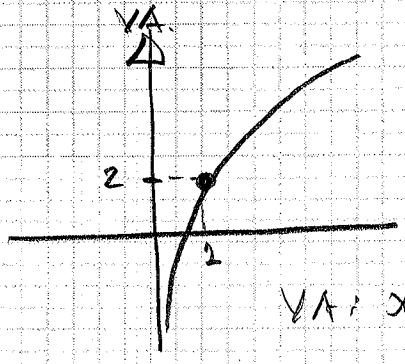


VA: $x = 0$

$f(x) = \log x$

Dom $= (0, +\infty)$

Range $= (-\infty, +\infty)$



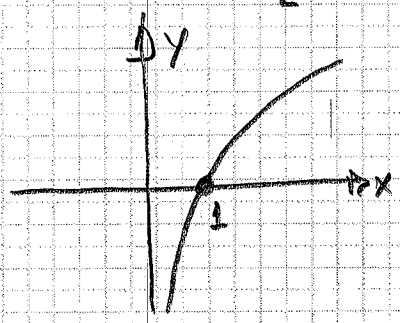
VA: $x = 0$

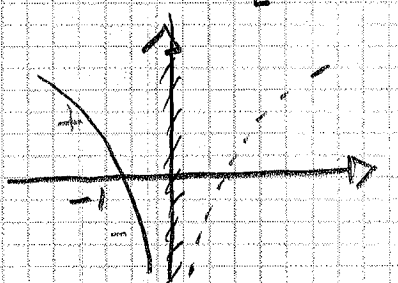
Dom $= (0, +\infty)$

Range $= (-\infty, +\infty)$

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

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





Reflection on the y-axis

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

Reflection on the x-axis