Finding Inverses of Exponentials

1) Find the inverse of $y = 4^x$

switch x and y

$x = 4^y$

write as log

$\log_4 x = \log_4 4^y$

"Log it off"

$\log_4 x = y$

2) Find the inverse of $y = 8^x$

$x = 8^y$

switch x and y

$\log_8 x = \log_8 8^y$

write as log

$\log_8 x = y$

"Log it off"

3) Find the inverse of $y = 3 + 2^x$

$x = 3 + 2^y$

switch x and y

$x - 3 = 2^y$

isolate exponential term

$\log_2 (x-3) = \log_2 2^y$

write as log

$\log_2 (x-3) = y$

"Log it off"

solve for y

Finding Inverses of Logs

1) Find the inverse of $y = \log_7 x$

switch x and y

$x = \log_7 y$

write as exponent

$7^x = 7^{\log_7 y}$

"Exponentiate"

$7^x = y$

2) Find the inverse of $y = \log(x - 2)$

switch x and y (base 10)

$x = \log(y - 2)$

write as exponent

$10^x = 10^{\log_{10}(y-2)}$

"Exponentiate"

$10^x = y - 2$

solve for y

$10^x + 2 = y$

3) Find the inverse of $y = 5 + \log x$

(common log (base 10))

switch x and y

$x = 5 + \log y$

isolate log term

$x - 5 = \log_{10} y$

write as exponent

$10^{x-5} = 10^{\log_{10} y}$

solve for y

$10^{x-5} = y$

Examples from today's homework worksheet

① $y = \log_5 x$

$x = \log_5 y$

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

$5^x = y$

② $y = \log_x 4$

$x = \log_y 4$

$y^x = y^{\log_y 4}$

$(y^x)^{\frac{1}{x}} = (4)^{\frac{1}{x}}$

$y = 4^{\frac{1}{x}}$

(13) $y = \log_5 x^2$

$x = \log_5 y^2$

$5^x = 5^{\log_5 y^2}$

$(5^x)^{\frac{1}{2}} = (y^2)^{\frac{1}{2}}$

$5^{\frac{x}{2}} = y$

20) $y = -4\log_6(x+10)$

$\frac{x}{-4} = \frac{-4\log_6(y+10)}{-4}$

$-\frac{x}{4} = \log_6(y+10)$

$6^{-\frac{x}{4}} = 6^{\log_6(y+10)}$

$6^{-\frac{x}{4}} = y+10$

$6^{-\frac{x}{4}} - 10 = y$

30) $y = \frac{3^x}{2}$

$x = \frac{3^y}{2}$

$2x = 3^y$

$\log_3 2x = \log_3 3^y$

$\log_3 2x = y$

40.) $y = \log_3(4^x - 1)$

$x = \log_3(4^y - 1)$

$3^x = 3^{\log_3(4^y-1)}$

$3^x = 4^y - 1$

$+1 \quad +1$

$3^x + 1 = 4^y$

$\log_4(3^x+1) = \log_4 4^y$

$\log_4(3^x+1) = y$