HAT
The Inverse of the Exponential Function

11/17/17

Warm Up:

- Graph $f(x) = 2^x$ and $y = f^{-1}(x)$
- State the domain/range of $f(x) = 2^x$ and $y = f^{-1}(x)$
- Find the equation of $y = f^{-1}(x)$
- Is $f(x) = 2^x$ a one-to-one function? $y = f^{-1}(x)$?

$f(x) = 2^x$

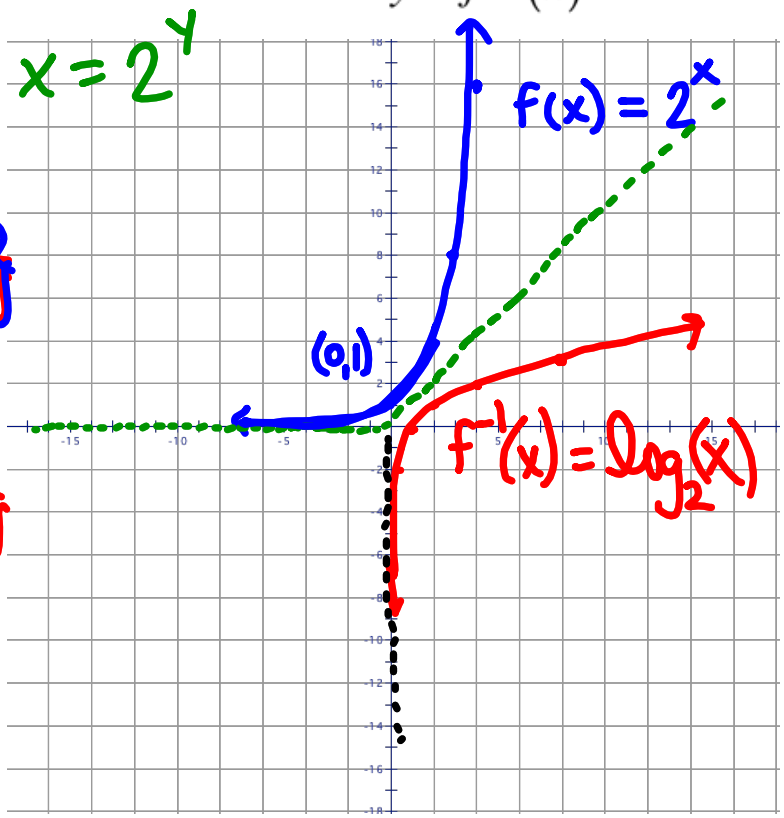
$D: \{x \mid x \in \mathbb{R}\}$

$R: \{y \mid y \in (0, \infty)\}$

$f^{-1}(x)$

$D: \{x \mid x \in (0, \infty)\}$

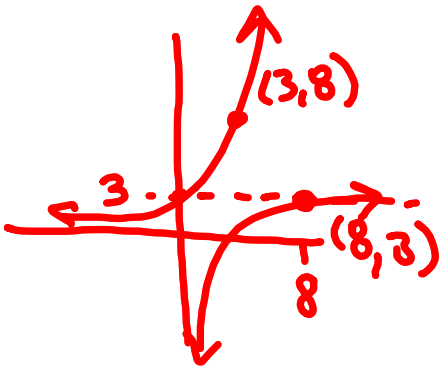
$R: \{y \mid y \in \mathbb{R}\}$



(reversibility)

Ex#1a: Solve $2^x = 8$

$x = 3 \quad (3, 8)$



Ex#1b: Solve $\log_2 x = 3$

$(x, 3)$

$(8, 3)$

$x = 8$

Ex#1c) Solve $6^x = 216$

$6^x = 6^3$

$x = 3$

Ex#1d: Solve $\log_6 x = 3$

$x = 216$

$\log_6 216 = 3$

$\log_6 6^3 = 3$

Ex#2: Show the composition of $f(x) = 2^x$ and $f^{-1}(x) = \log_2 x$.
Form both $y = f\left(f^{-1}(x)\right)$ and $y = f^{-1}(f(x))$.

$f(f^{-1}(x)) =$

$2^{\log_2 x} = x$

$f^{-1}(f(x)) =$

$\log_2 2^x = x$

$x = 2^y$

$\log_2 x = \log_2 2^y$

$\log_2 x = y$

Ex#3: Sort these expressions into two categories... "equal to 8" and "NOT equal to 8".

Equal to 8	NOT Equal to 8
$\log_2 2^8$	$\log_5 5^{\log_5 3} = \log_5 3$
$5^{\log_5 8}$	$\log_2 2^{\log_2 8} = \log_2 8$, $\log_2 2^3 = 3$
$\log_5 5^8$	$5^{\log_5 5^3} = 5^3$
$2^{\log_2 8}$	$\log_5 5^{\log_5 8} = \log_5 8$
$2^{\log_2 2^3}$	

Assignment: page 472 #25-35 odd, 37, 38
page 480 #9-15 odd