Section 3.6 One-to-one Functions; Inverse Functions

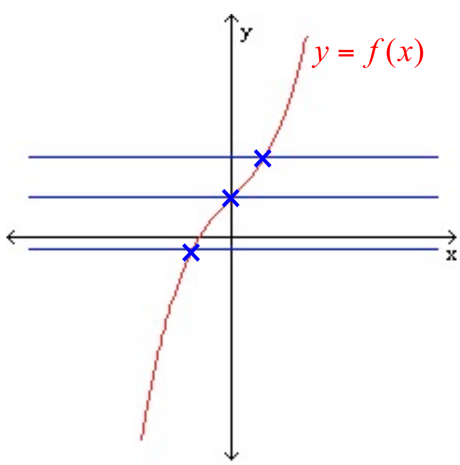
Objective 1: Understanding the Definition of a One-to-one Function

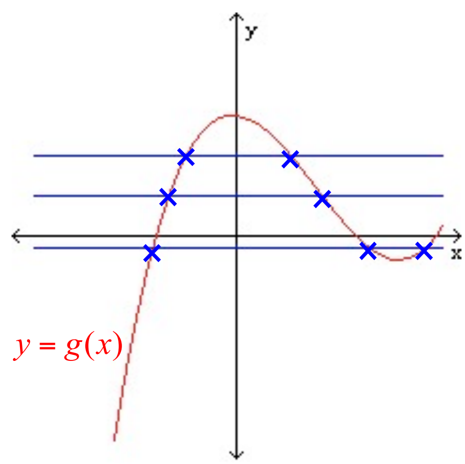
Definition **One-to-one Function**

A function f is **one-to-one** if for any values $a \neq b$ in the domain of f, $f(a) \neq f(b)$.

Interpretation: For a function *f(x)* = *y*, we know that for each *x* in the Domain there exists one and only one *y* in the Range. For a one-to-one function *f(x)* = *y,* for each *x* in the Domain there exists one and only one *y* in the Range AND for each *y* in the Range there exists one and only one *x* in the Domain.

Objective 2: Determining if a Function is One-to-one Using the Horizontal Line Test



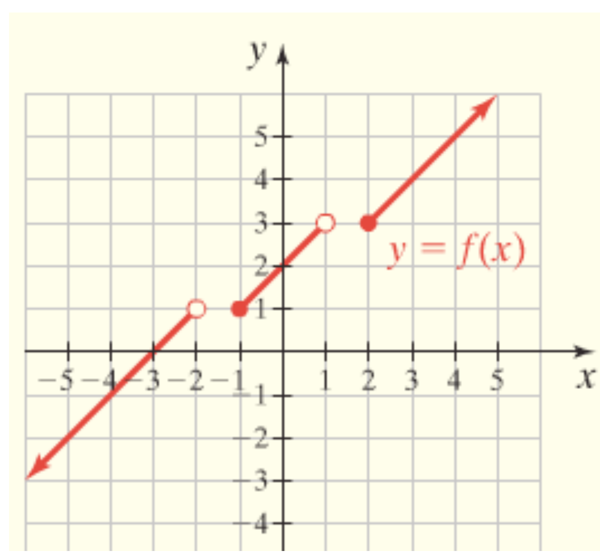


The Horizontal Line Test If every horizontal line intersects the graph of a function f at most once, then f is one-to-one.

3.6.4 and 16
Determine whether the given functions are one-to-one.

4. $f(x) = (x-1)^2, x \geq -1$

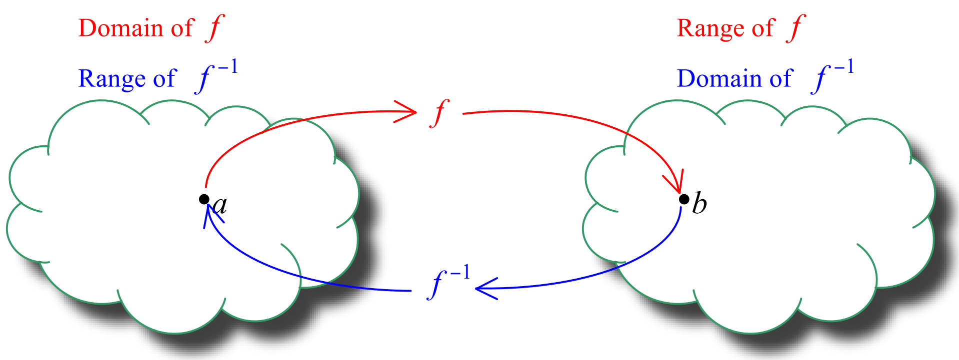
16.



Objective 3: Understanding and Verifying Inverse Functions

Every one-to-one function has an inverse function.

Definition	**Inverse Function** Let f be a one-to-one function with domain A and range B. Then f^{-1} is **the inverse function of f** with domain B and range A. Furthermore, if $f(a)=b$ then $f^{-1}(b)=a$.



CAUTION Do not confuse f^{-1} with $\dfrac{1}{f(x)}$. The negative 1 in f^{-1} is NOT an exponent!

Inverse functions "undo" each other.

Composition Cancellation Equations

$f\left(f^{-1}(x)\right)=x$ for all x in the domain of f^{-1} and

$f^{-1}\left(f(x)\right)=x$ for all x in the domain of f

3.6.18

Determine whether f and g are inverse functions using the composition cancellation equations.

$$f(x)=\frac{3}{2}x-4,\quad g(x)=\frac{2x+8}{3}$$