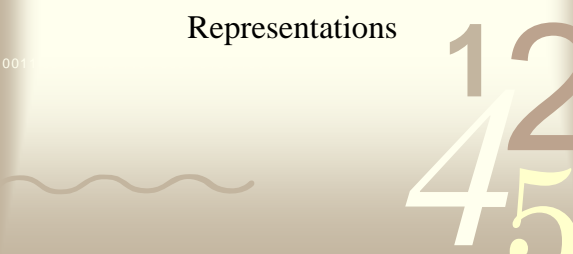


001

## 5.2 Inverse Functions & Their Representations



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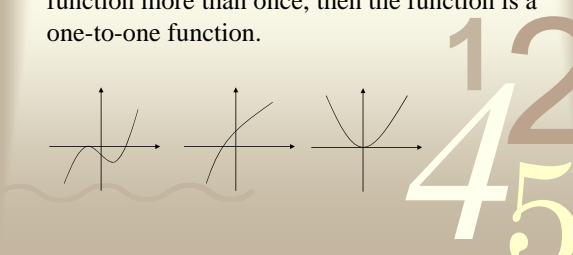
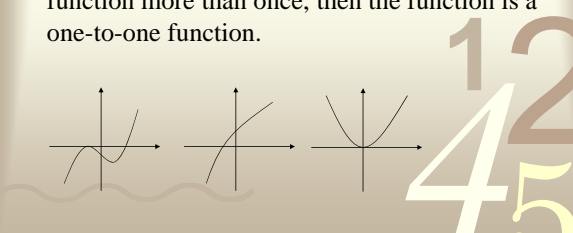
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### Horizontal Line Test

If no horizontal line intersects the graph of a function more than once, then the function is a one-to-one function.



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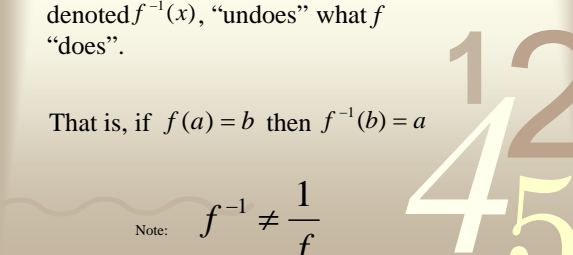
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### Inverse of a function

If  $f(x)$  is a function, its inverse, denoted  $f^{-1}(x)$ , “undoes” what  $f$  “does”.

That is, if  $f(a) = b$  then  $f^{-1}(b) = a$

Note:  $f^{-1} \neq \frac{1}{f}$



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### Relationship between a function and its inverse

- The domain of  $f$  is the range of  $f^{-1}$  and the range of  $f$  is the domain of  $f^{-1}$ .
- If  $(a, b)$  is an ordered pair on the graph of  $f$ , then  $(b, a)$  is an ordered pair on the graph of  $f^{-1}$ .
- The graph of  $f^{-1}$  is the graph of  $f$  reflected about the line  $y = x$ .

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### Relationship between a function and its inverse

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

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### To find the inverse of a function:

- Write the function as  $y = f(x)$
- Exchange  $x$  &  $y$
- Solve for  $y$
- Write the solution using inverse notation

Example  $f(x) = 5x$

$$y = 5x$$

$$x = 5y$$

$$y = \frac{1}{5}x$$

$$f^{-1}(x) = \frac{1}{5}x$$

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### Examples

For the function given, find  $f^{-1}(x)$

a.  $f(x) = 1 - \frac{1}{2}x^3$

b.  $f(x) = \frac{x-1}{2}$

c.  $f(x) = \frac{3x}{x-1}$

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### Examples

• Restrict the domain of  $f(x) = x^4 - 1$  so that  $f$  is one-to-one. Then find its inverse.

• p. 396, problem 106

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