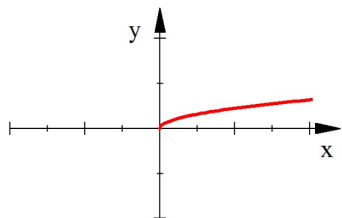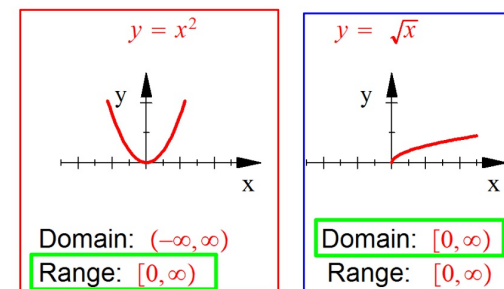## Slide 1

Graph of $y = \sqrt{x}$

What is the Domain and Range?

Domain:

$[0, \infty)$

Range:
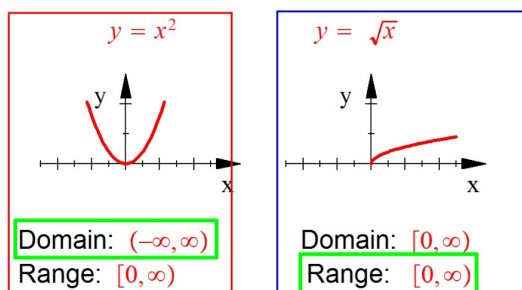
$[0, \infty)$

Slide 2

How does the domain of $y = \sqrt{x}$ compare to the range of $y = x^2$

The domain of the inverse is the same as the range of the original function.

$y = x^2$

Domain: $(-\infty, \infty)$
Range: $[0, \infty)$

$y = \sqrt{x}$

Domain: $[0, \infty)$
Range: $[0, \infty)$

Slide 3

How does the range of $y = \sqrt{x}$ compare to the domain of $y = x^2$

The range of the inverse is NOT the same as the domain of the original function!

$y = x^2$

Domain: $(-\infty, \infty)$
Range: $[0, \infty)$

$y = \sqrt{x}$

Domain: $[0, \infty)$
Range: $[0, \infty)$

Slide 4

SAS4 - Topic 2

answer question #12

answer question #12

No, when you take all the points from the function $y = x^2$ and reflect them over the line y=x you get the entire sideways parabola and this will NOT be a function.

Read question #13

What do you think?

One-to-one Functions:

Each y-value can come from ONLY ONE x-value

Phrased another way
One y-value can't come from different x-values.
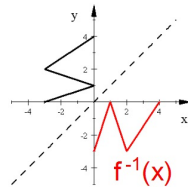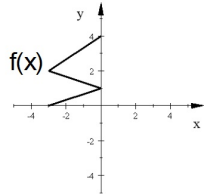
Only one-to-one functions have inverses that ARE functions.

For example: $y = x^2$ is NOT one-to-one because y = 4 can come from x = 2 and x = -2

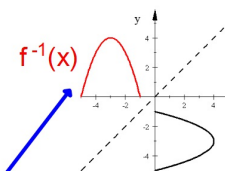Will the inverse relation be a function?
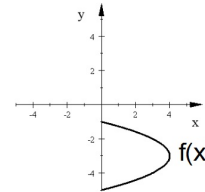
A

f(x)

$f^{-1}(x)$

Inverse IS a function because it passes the Verical Line Test.

Will the inverse relation be a function?

B

f(x)

$f^{-1}(x)$

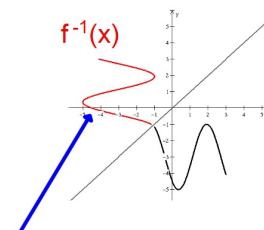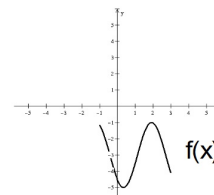Inverse IS a function because it passes the Verical Line Test.

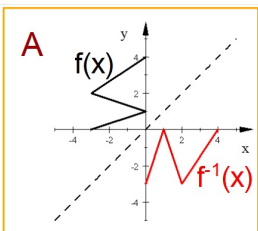## Will the inverse relation be a function?

C

f(x)

f⁻¹(x)
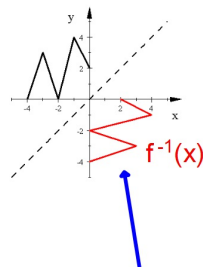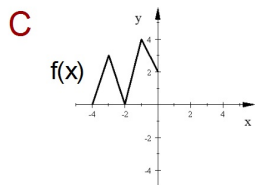
Inverse is NOT a function because it fails the Verical Line Test.
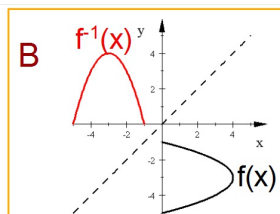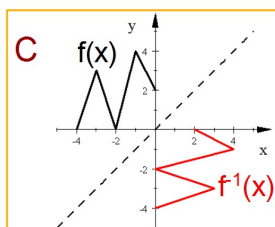
Will the inverse relation be a function?

D

f⁻¹(x)

f(x)

Inverse is NOT a function because it fails the Verical Line Test.
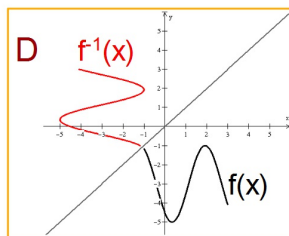
A

f(x)

f⁻¹(x)

Inverse IS a Function

B

f⁻¹(x)

f(x)

Given the graph of an orginal relation, how do you tell if the inverse relation is a function without actually graphing the inverse?

C

f(x)

f⁻¹(x)

D

f⁻¹(x)

f(x)

Inverse is NOT a function

Horizontal Line Test: a visual test to determine if the inverse relation will be a function.

If any horizontal line can intersect a graph more than once then the graph of the inverse is NOT a function

this is because:
Horizontal lines on f(x) become vertical Lines on f⁻¹(x).
If a Horizontal line touches the graph of f(x) more than once the corresponding vertical line on f⁻¹(x) will touch the inverse more than once.

SAS4 - Topic 2
answer question #13

For an original function to have an inverse that is also a function:

- The original function must be one-to-one

or

- The original function must pass the Hoizontal Line Test.
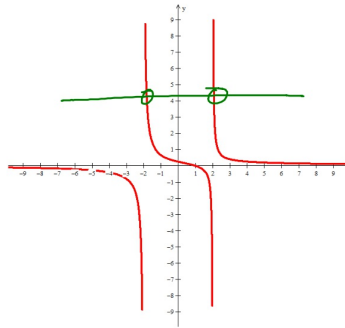

Is the inverse a function?

$$f(x) = -4x + 1$$

Yes, the inverse is a function because no Horizontal Line will touch the orginal graph more than once so no Vertical Line will touch the inverse more than once.
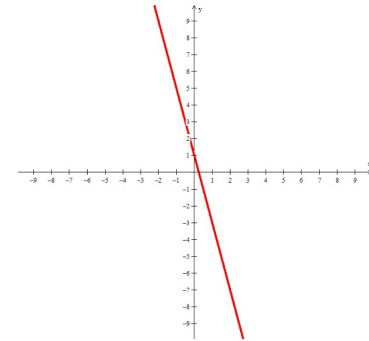
Is the inverse a function?

$$y = \frac{x - 1}{x^2 - 4}$$

No, the inverse is not a function because there is a Horizontal Line that will touch the orginal graph more than once which meant that there is Vertical Line that will touch the inverse more than once.

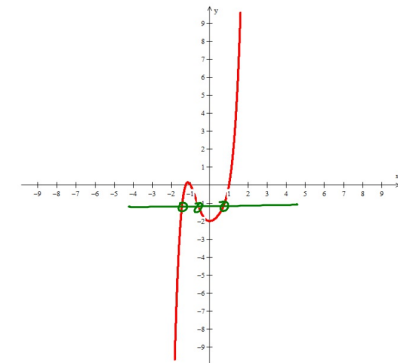---

Is the inverse a function?

$$y = x^5 - x^3 + 2x^2 - 2$$

No, the inverse is not a function because there is a Horizontal Line that will touch the orginal graph more than once which meant that there is Vertical Line that will touch the inverse more than once.

SAS4 - Topic 2
answer question #14

SAS4 - Topic 2
answer question #15

You must make the original function one-to-one

How do you do this?

CUT OFF PART OF THE ORIGINAL (Restrict the domain)