



4. Inverse of a Function

INVERSE FUNCTION-

Function that **exactly reverses** the transformations produced by function ,f

Inverse of a Function

The inverse of a function is the function which will “undo” what the original function will do.

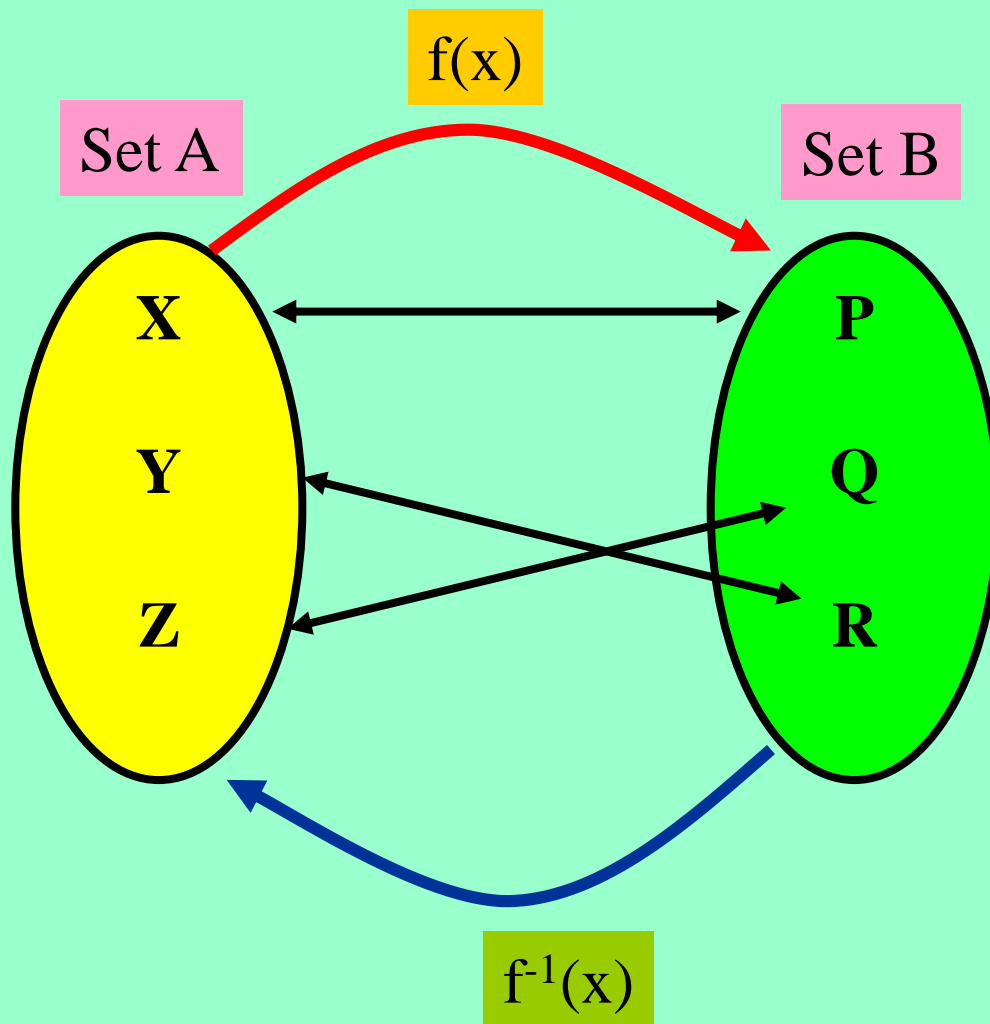
You will already have come across some inverses:

To “undo” an **addition** we **subtract**

To “undo” a **multiplication** we **divide**

To “undo” a **square root** we **square**

Establishing whether a function has an inverse



1. To have an inverse, each element of Set A can correspond to only one element in set B.

“a 1 to 1 correspondence”

2. When a 1 to 1 correspondence exists there will be a function which takes set B as its domain and maps from Set B to Set A.

This is the inverse, $f^{-1}(x)$



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3. When dealing with composite functions, if you apply $f^{-1}(x)$ to $f(x)$ you will return to x .

$$\text{That is, } f(f^{-1}(x)) = f^{-1}(f(x)) = x$$

So if the answer to the composite of two functions is x , they are Inverses.

Finding the Inverse Function

Copy the following

Finding the inverse function is a matter of changing the subject to X and remembering that x's are now y's because we have swapped the domain and range around.

Example 1

If $f(x) = 3x - 7$ find $f^{-1}(x)$

Solution:

1. Change the subject to x.

2. Change x's to y's and vice versa.

$$f(x) = 3x - 7$$

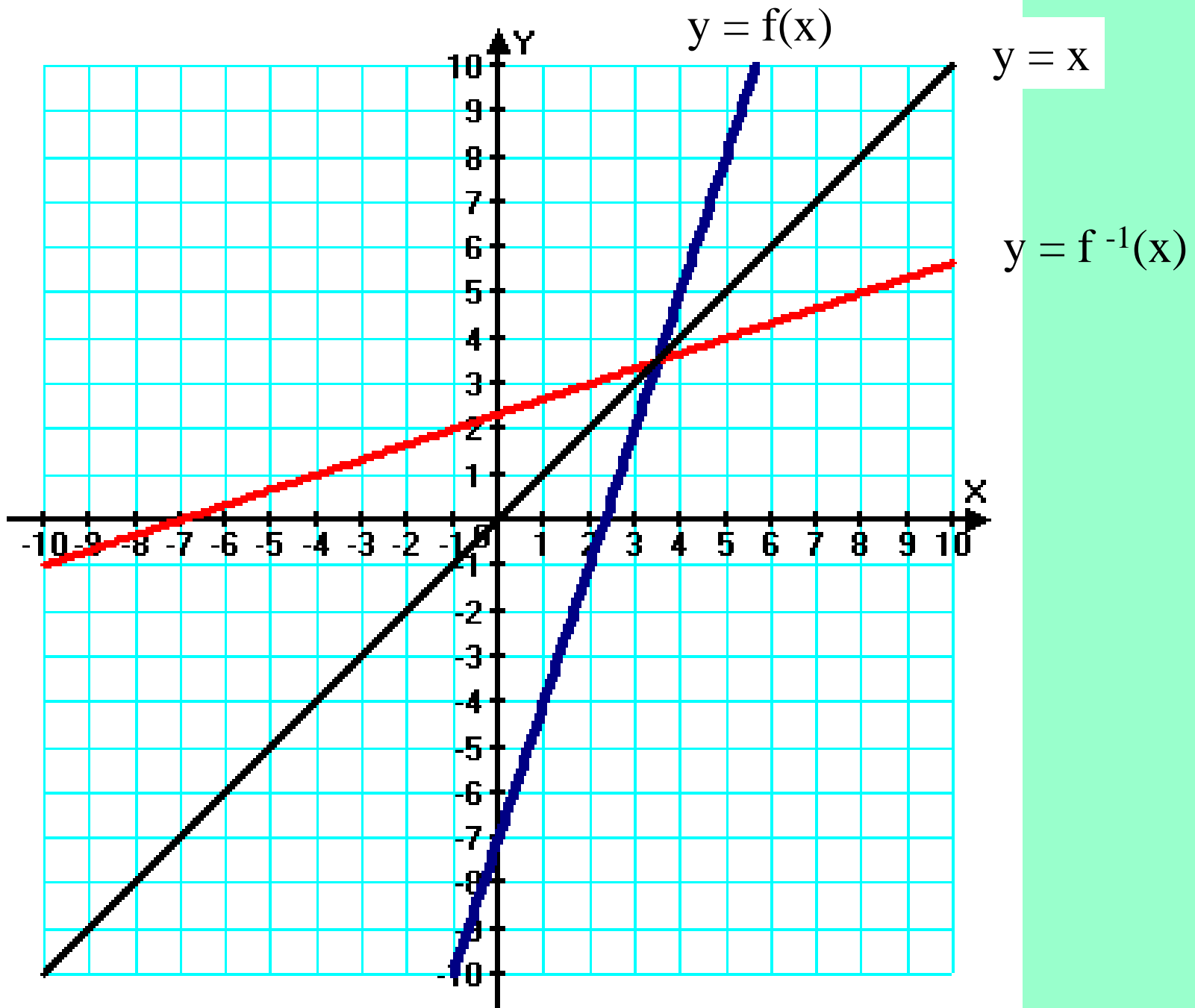
$$y = 3x - 7$$

$$y + 7 = 3x$$

$$x = \frac{y + 7}{3}$$

$$y = \frac{x + 7}{3}$$

$$f^{-1}(x) = \frac{x + 7}{3}$$



Finding the Inverse Function

Copy the following

Example 2

Important as could have two results for x^2 so no 1 to 1

If $g(x) = x^2 + 4, x > 0$ find $g^{-1}(x)$

$$g(x) = x^2 + 4$$

$$y = x^2 + 4$$

$$y - 4 = x^2$$

$$x = \sqrt{y - 4}$$

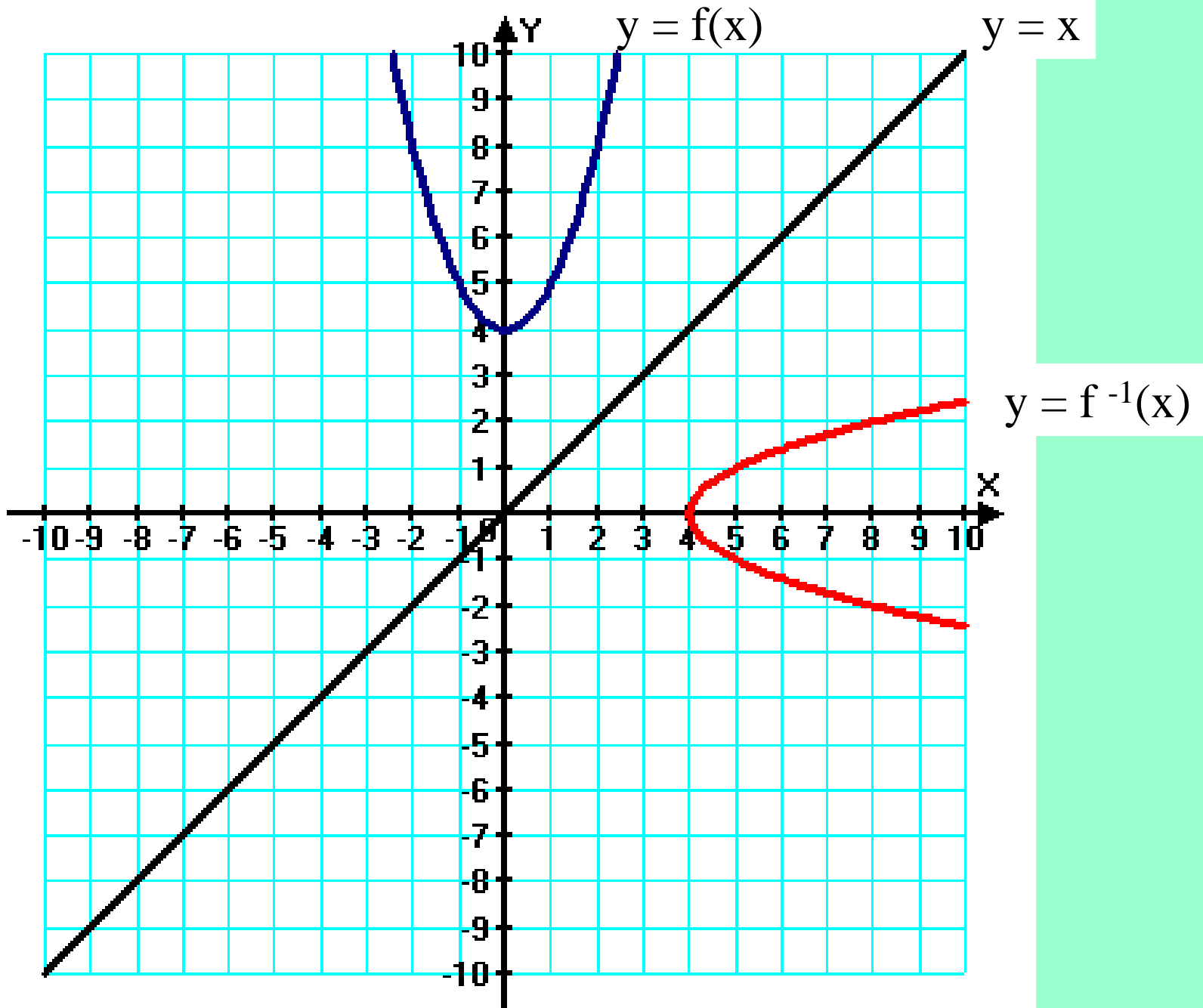
$$y = \sqrt{x - 4}$$

$$g^{-1}(x) = \sqrt{x - 4}$$

Solution:

1. Change the subject to x .

2. Change x 's to y 's and vice versa.



Heinemann , p.28, EX 2D

Q2, 4, 5