

## Questions on Lesson 1.3 HW?

$$b^x = b^y \quad \text{*look at 1-7 on pg.20*}$$

$$2^8 = 2^{2x}$$

Solve for the value of x.

1.  $5^{x+1} = 5^{2x-3}$

$$\begin{array}{r} x+1 = 2x-3 \\ -x \quad -x \\ \hline 1 = x-3 \\ +3 \quad +3 \\ \hline 4 = x \end{array}$$

2.  $7^{3x-2} = 7^{-2x+8}$

3.  $4^{3x} = 2^{2x-8}$

$$2^{2 \cdot 3x} = 2^{2x-8}$$

$$6x = 2x - 8$$

$$\vdots$$

4.  $3^{5x-4} = 9^{2x-3}$

$$3^{5x-4} = 3^{2(2x-3)}$$

5.  $8^{x+1} = 2^{2x+3}$

6.  $5^x = \left(\frac{1}{125}\right)$

$$5^x = 5^{-3}$$

$$x = -3$$

7.  $3^{x+1} = \left(\frac{1}{81}\right)$

$$3^{x+1} = 3^{-4}$$

$$x+1 = -4$$

$$\vdots$$

Graph  $y = \log_{10} x$

TI-SmartView™ for the TI-84 Plus

File Edit View Tools Scripts Help

The image shows a TI-84 Plus Silver Edition calculator interface with several components:

- Calculator Screen:** A blank coordinate plane with x and y axes.
- Equation Editor:** Shows  $Y_1 = \log(X)$ . Handwritten in blue:  $y = \log_a x$  and  $x = a^y$ .
- Table:**

X	Y1
0	ERROR
1	.30103
2	.47712
3	.60206
4	.69897
5	.77815
- Graphing Area:** A blank coordinate plane with handwritten notes:
  - Blue:  $(2) 3^2 = 9$
  - Red:  $a=3$ ,  $y=2$ ,  $x=9$
  - Red:  $2 = \log_3 9$
  - Black:  $y = \log_{10}$
- Key Press History:** Shows "Large Screen" and "Hide Key Press History" button.
- Bottom Panel:** Includes buttons for "STAT PLOT F1", "Y=", "LINK X,T,θ,n", "CLEAR", "TABLE F5", and "GRAPH".

Finding Inverse Functions Algebraically

- ① Switch  $x$  &  $y$
- ② Solve for  $y$ .

## 1.4 Pulling a Rabbit Out of a Hat

*A Solidify Understanding Task*



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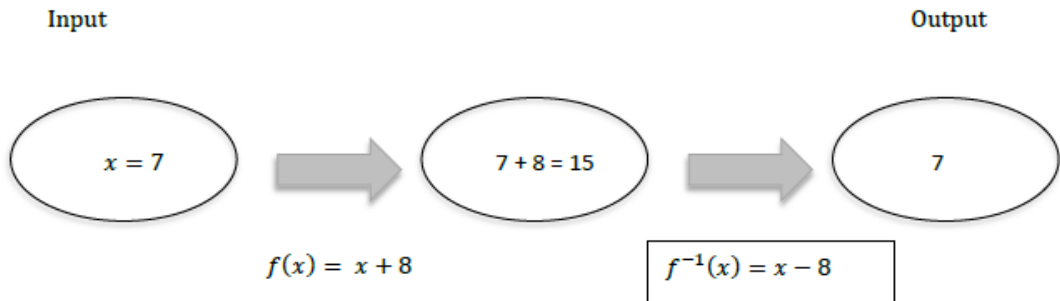
I have a magic trick for you:

- Pick a number, any number.
- Add 6
- Multiply by the result by 2
- Subtract 12
- Divide by 2
- The answer is the number you started with!

People are often mystified by such tricks but those of us who have studied inverse operations and inverse functions can easily figure out how they work and even create our own number tricks. Let's get started by figuring out how inverse functions work together.

For each of the following function machines, decide what function can be used to make the output the same as the input number. Describe the operation in words and then write it symbolically.

Here's an example:



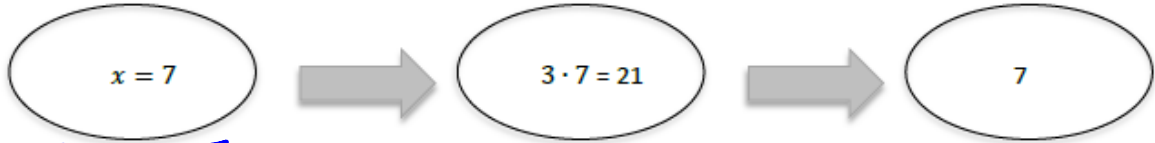
In words: Subtract 8 from the result

$$\begin{array}{l}
 * \quad x \quad y \\
 \textcircled{1} \quad x = y + 8 \\
 \quad \quad \underline{-8} \quad \underline{-8} \\
 \textcircled{2} \quad x - 8 = y \\
 \\
 f^{-1}(x) = x - 8
 \end{array}$$

1.

Input

Output



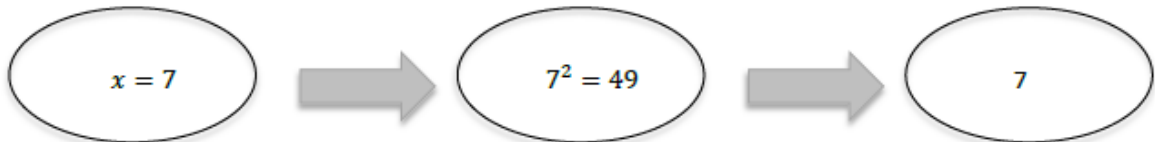
①  $x = \frac{3y}{3}$   
 ②  $\frac{x}{3} = y$   
 $f^{-1}(x) = \frac{x}{3}$

$f(x) = 3x$

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

In words: ÷ by 3

Output



$f(x) = x^2$

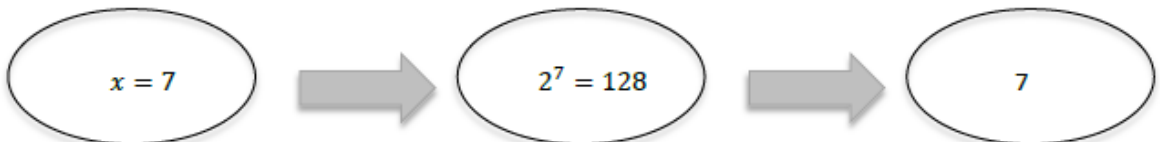
$f^{-1}(x) = \sqrt{x}$

In words:

Input

Output

3.



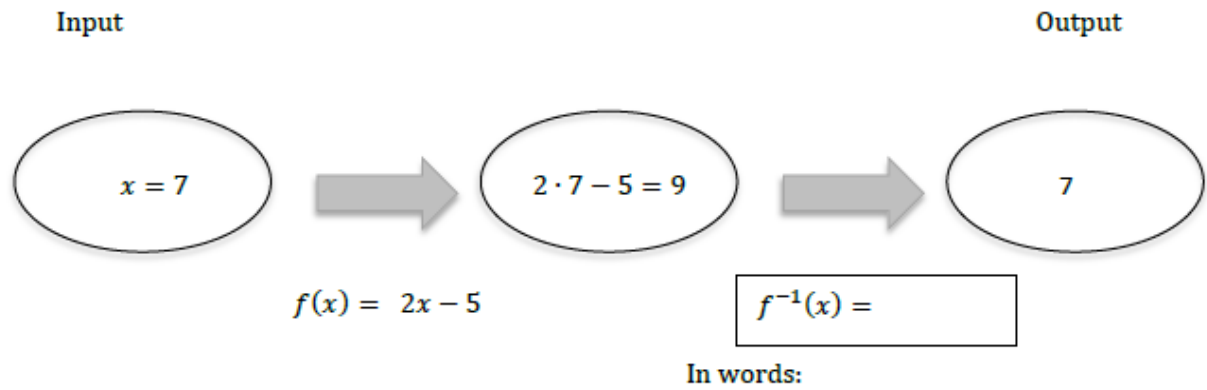
$f(x) = 2^x$

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

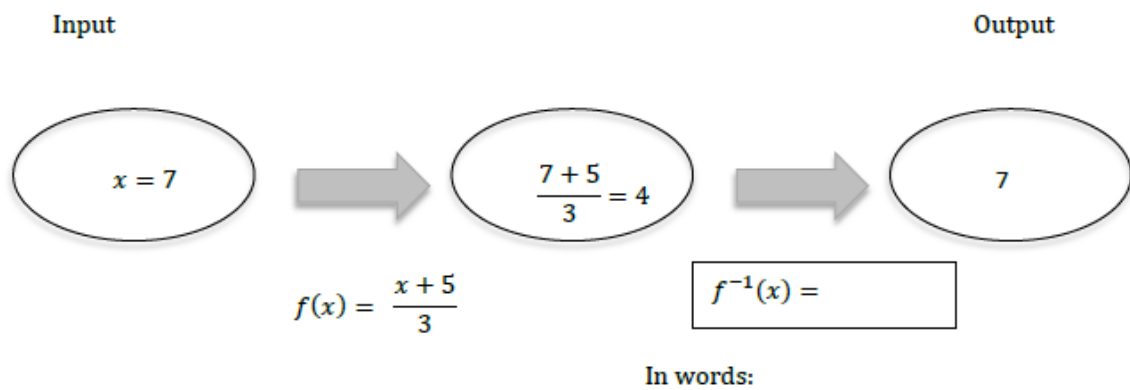
In words:

①  $x = 2^y$   
 $\frac{y \cdot \log(2)}{\log(2)} = \frac{\log(x)}{\log(2)}$   
 $= \log_2 x$

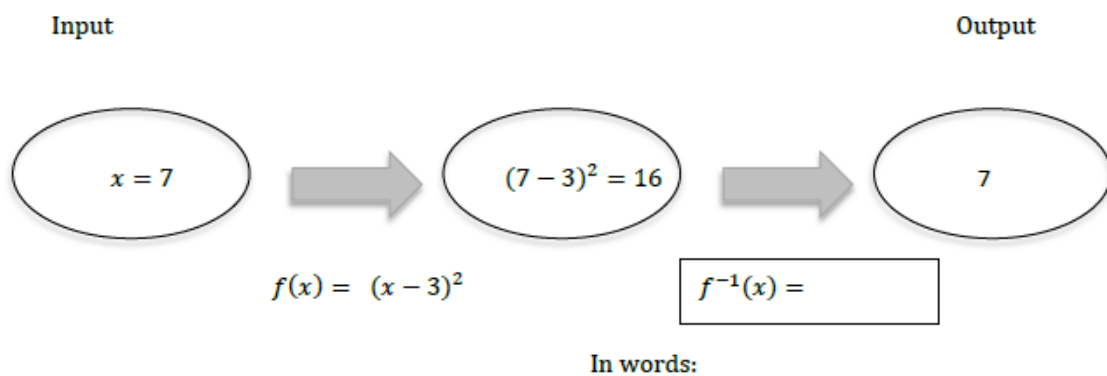
4.



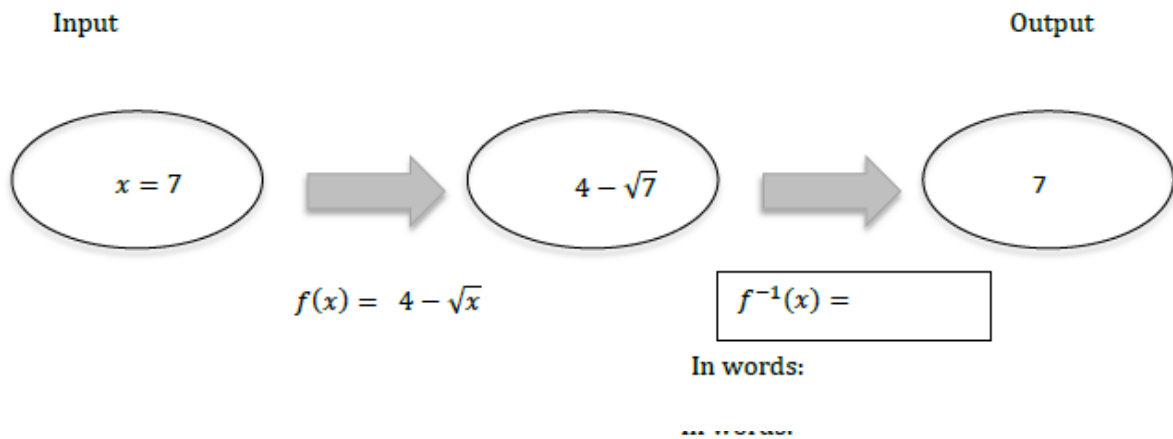
5.



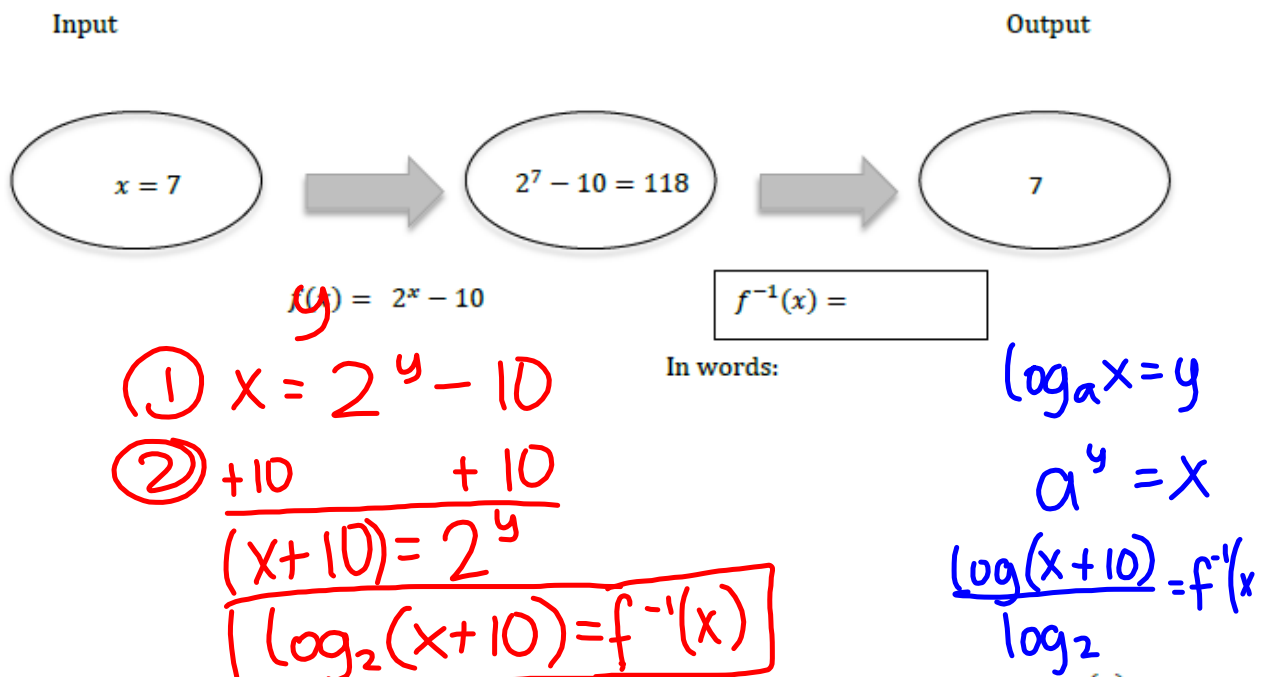
6.



7.



8.



9. Each of these problems began with  $x = 7$ . What is the difference between the  $x$  used in  $f(x)$  and the  $x$  used in  $f^{-1}(x)$ ?

10. In #6, could any value of  $x$  be used in  $f(x)$  and still give the same output from  $f^{-1}(x)$ ? Explain. What about #7?

11. Based on your work in this task and the other tasks in this module what relationships do you see between functions and their inverses?

# Homework/Classwork

Finish 1.4