Evaluating Functions - NB p. 78

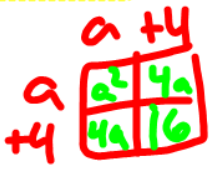
calculate the following values or expressions.

$g(x) = 2(x + 3)^2$

a. $g(-5)$

b. $g(a + 1)$

c. x when $g(x) = 32$



$g(-5) = 2(-5+3)^2$ $g(-5) = 2(-2)^2$ $g(-5) = 2 \cdot 4$ $g(-5) = 8$

$g(a+1) = 2(a+1+3)^2$ $g(a+1) = 2(a+4)^2$ $g(a+1) = 2[a^2+8a+16]$ $g(a+1) = 2a^2+16a+32$

$32 = 2(x+3)^2$ $16 = (x+3)^2$ $16 = ?^2$

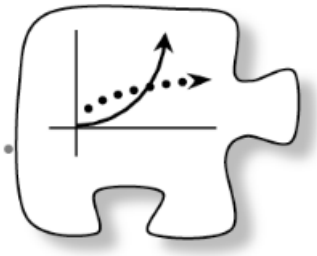
divide by 2

$\sqrt{16} = |x+3|$

$x+3=4$ $x+3=-4$

$x=1$ $x=-7$

5.1.3 What can I do with inverses?



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More Inverse Functions

In this chapter you first learned how to determine an inverse by undoing the operations of a function. Then you learned how to determine an inverse graphically and you compared the tables of functions and their inverses. In this lesson you will continue to connect these representations.

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5-39. Consider the table at right.

a. Write an equation for the function represented in the table at right.

b. Make a table for the inverse. How is the table for the inverse related to the table for the original function?

c. Write an equation for the inverse function.

x	$f(x)$
1	−5
3	7
5	19
7	31

5-40. Write the inverse function of the following functions, clearly showing all your steps.

a. $y = 6x - 11$

Steps:

1) ·6

2) −11

Inverse:

+11

÷6

$y = \frac{x+11}{6}$

x	$f^{-1}(x)$
−5	1
7	3
19	5
31	7

$y = \frac{1}{6}x + \frac{11}{6}$

5-40. Write the inverse function of the following functions, clearly showing all your steps.

a. $f(x) = 2(x-1)^3$

Steps f(x)

1) -1
2) cube
3) ·2

Inverse

1) ÷2
2) $\sqrt[3]{}$
3) +1

$f^{-1}(x) = \sqrt[3]{\frac{x}{2}} + 1$

b. $f(x) = 3\left(\frac{x-9}{2}\right) + 20$

Steps f(x)

1) -9
2) ÷2
3) ·3
4) +20

Steps for $f^{-1}(x)$

1) -20
2) ÷3
3) ·2
4) +9

$f^{-1}(x) = 2\left(\frac{x-20}{3}\right) + 9$

$f(11) = 3\left(\frac{11-9}{2}\right) + 20$

$f(11) = 3\left(\frac{2}{2}\right) + 20$

$f(11) = 3(1) + 20$

$f(11) = 3 + 20$

$f(11) = 23$

. $f(x) = 2(x-1)^3$

$y = 2(x-1)^3$

Solve for y: $\frac{x}{2} = \frac{2(y-1)^3}{2}$

1) ÷2
2) $\sqrt[3]{}$
3) +1

$\sqrt[3]{\frac{x}{2}} = \sqrt[3]{(y-1)^3}$

$\sqrt[3]{\frac{x}{2}} = y-1$

$\sqrt[3]{\frac{x}{2}} + 1 = y$

b. $f(x) = 3\left(\frac{x-9}{2}\right) + 20$

$y = 3\left(\frac{x-9}{2}\right) + 20$

Solve for y:

$x = 3\left(\frac{y-9}{2}\right) + 20$

$-20 \qquad -20$

$x - 20 = 3\left(\frac{y-9}{2}\right)$

$2\left(\frac{x-20}{3}\right) = \left(\frac{y-9}{2}\right)^2$

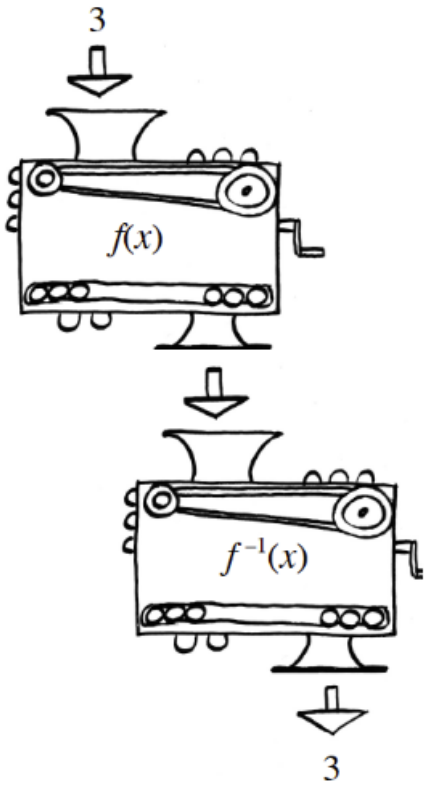
$2\left(\frac{x-20}{3}\right) = y - 9$

$+9 \qquad +9$

Steps for

1) -20
2) $\div 3$
3) $\cdot 2$
4) $+9$

5-41. Adriena's strategy for checking that the functions $f(x)$ and $f^{-1}(x)$ are inverses of each other is to think of them as stacked function machines. She starts by choosing a number to drop into $f(x)$. Then she drops the output from $f(x)$ into $f^{-1}(x)$. If she gets her original number, she is pretty sure that the two functions are inverses.



a. With your team, select a pair of inverse functions from problem 5-40, then use Adriena's ideas to test them.

b. Adriena wants to show her work algebraically. She knows that if she chooses her input for $f(x)$ to be 3, she can write the output as $f(3)$. Next, $f(3)$ becomes the input for $f^{-1}(x)$, and her output is 3. Since $f(3)$ is the new input for $f^{-1}(x)$, she thinks that she can write this process as $f^{-1}(f(3)) = 3$. Does her idea make sense? Why or why not?

c. Does Adriena's strategy confirm the functions are inverses of each other? Is there anything else she should check?

d. Use your strategy from part (c) to confirm that $f(x)$ is the inverse of $f^{-1}(x)$. Write an equation that expresses your results algebraically using the notation from part (b).

e. Will this strategy for testing inverses work with any input?

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

5-42. Adriena had to find the inverse function of $f(x) = (x - 3)^2 + 2$. She got the equation $f^{-1}(x) = \sqrt{x-2} + 3$. Will her stacked function machine method work?

a. Use Adriena's idea from problem 5-41 to verify that the functions are inverses of each other. Each person on your team should choose a different number for the input. Be sure to stack the function machines in both orders.

b. Adriena's friend Cemetra decided to check $f^{-1}(f(-5))$. What happened? Why did this happen?

c. How can you restrict the domain of $f(x)$ to make sure the functions are inverses of each other? Sketch a graph of the function and the inverse to confirm your answer.