Math-3 Lesson 6-6 (Solving Equation Using Inverse Functions)

Function A: heating by 10 degrees

What is the inverse of this function?

"Cooling something down by 10 degrees"

Function B: cooling by 10 degrees

The temperature of a bowl of soup is 100 degrees.

The temperature of a bowl of soup is 100 degrees. Apply <u>function A</u> then <u>function B</u> (in sequence) to the bowl of soup. What is the <u>final temperature</u> of the soup?

Temperature = 100 + 10 - 10



What function would "undo" a:
1.
$$f(x) = \{x^4, x = [0, \infty)\}$$
 $f^{-1}(x) = \sqrt[4]{x}$
2. $g(x) = x^{\frac{2}{3}}$ $g^{-1}(x) = x^{\frac{3}{2}}$
3. $h(x) = x^{\frac{4}{5}}$ $h^{-1}(x) = ? = x^{\frac{5}{4}}$
4. $k(x) = x^5$ $k^{-1}(x) = ? = x^{\frac{1}{5}} = \sqrt[5]{x}$

$$f(x) = (x+1)^{\frac{2}{3}} \qquad f^{-1}(x) = ?$$

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

$$x^{\frac{3}{2}} = \left((y+1)^{\frac{2}{3}}\right)^{\frac{3}{2}}$$

$$x^{\frac{3}{2}} = y+1$$

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

We use compositions of inverse functions to solve equations.

$$(x-3)^{2} + 4 = 40$$
 "Isolate the square, undo the square".

$$-4 -4$$

$$(x-3)^{2} = 36$$

$$\sqrt[2]{(x-3)^{2}} = \sqrt{36}$$
 "undo the square" means
"inverse function" of the square

$$x-3 = \pm 6$$

$$x = 3 + 6 = 9$$

$$x = 3 - 6 = -3$$

Solve
$$13 = x^4 - 3$$

 $16 = x^4$
 $\pm \sqrt[4]{16} = x$ $x = \pm 2$
Solve $\sqrt{2x+1} = 3$
 $(\sqrt{2x+1})^2 = 3^2$
 $2x = 8$
 $x = 4$
Solve $13 = x^4 - 3$
 $24 = 3x^3$ Isolate the power:
 $8 = x^3$
 $\sqrt[3]{8} = \sqrt[3]{x^3}$ undo the power
 $2 = x$



<u>Solve</u> :	Check your solution.
$\sqrt{x+3} + 5 = 0$	$\sqrt{22+3}+5=0$
$\sqrt{x+3} = -5$	$\sqrt{25} + 5 = 0$
x + 3 = 25	$5+5 \neq 0$ Extraneous solution.
x = 22	
$\sqrt{2-x} = -x$	x = -2, 1 Check your solutions.
$2 - x = (-x)^2$	$\sqrt{2 - (-2)} = -(-2)$
$2 - x = x^2$	$\sqrt{4} = 2$ Checks.
$0 = x^{2} + x - 2$ 0 = (x + 2)(x - 1)	$\sqrt{2-(1)} = -(1)$
	$\sqrt{1} \neq -1$ Extraneous solution.
	x = -2
	$x \neq 1$