1. Write an equation for the inverse of the relation.

a. $y = 12x - 6$ b. $y = -13x + 6$ c. $y = 4x - 1$

$y = \dfrac{x+6}{12}$

or

$y = \dfrac{x}{12} + \dfrac{1}{2}$

$y = \dfrac{x-6}{-13}$

or

$y = -\dfrac{x}{13} + \dfrac{6}{13}$

$y = \dfrac{x+1}{4}$

or

$y = \dfrac{x}{4} + \dfrac{1}{4}$

2. Sketch the function and its inverse in the same coordinate plane.   Is the inverse a function of x?
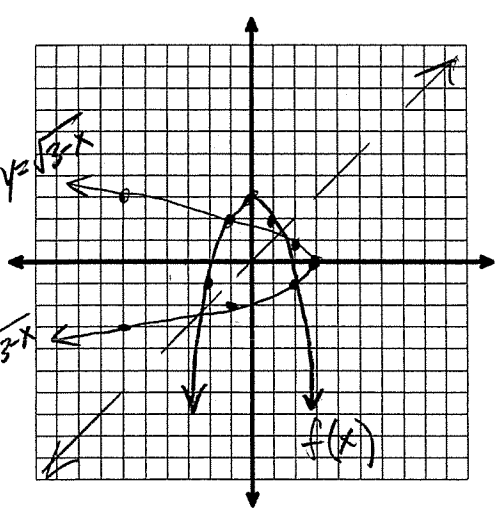
a. $f(x) = -x^2 + 3$

$y = -x^2 + 3$

$x = -y^2 + 3$

$x - 3 = -y^2$

$3 - x = y^2$

$\pm\sqrt{3-x} = y$

$y = \sqrt{3-x}$

$y = -\sqrt{3-x}$
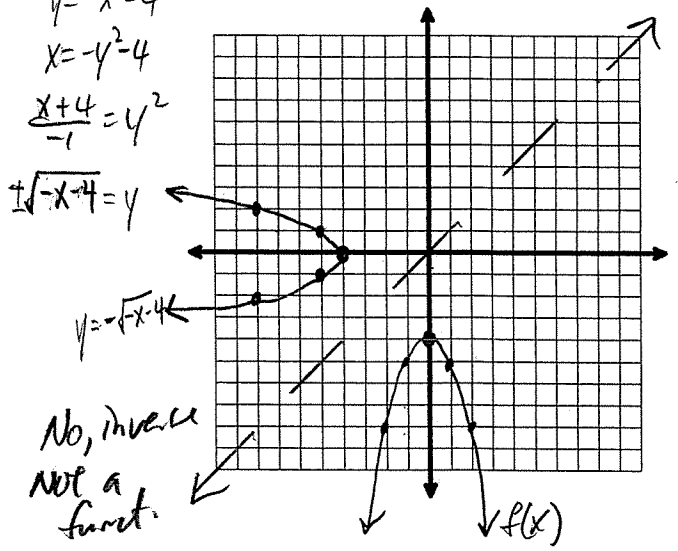
No, inverse is not a funct'n.

b. $f(x) = -x^2 - 4$

$y = -x^2 - 4$

$x = -y^2 - 4$

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

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

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

No, inverse not a funct.
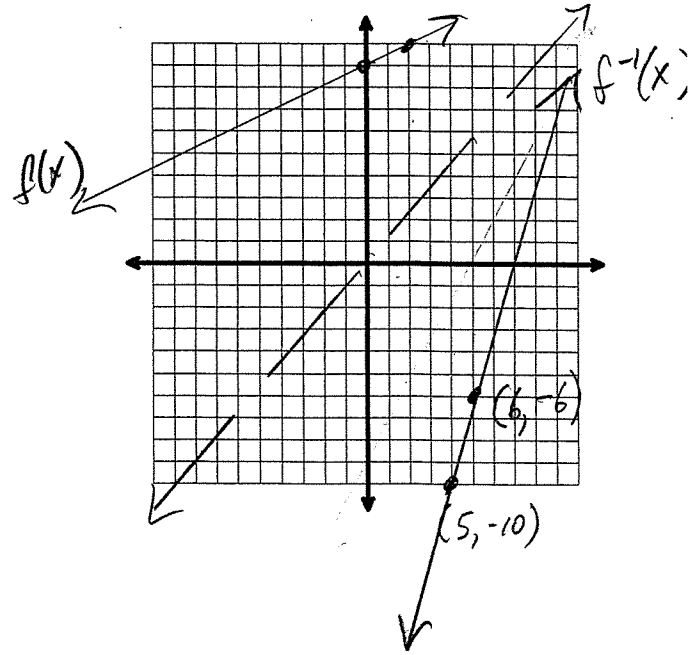
c. $f(x) = \dfrac{1}{2}x + 9$

$y = \dfrac{1}{2}x + 9$
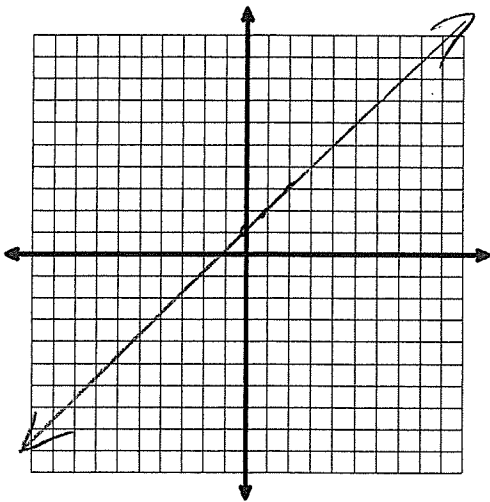
$x = \dfrac{1}{2}y + 9$

$2(x-9) = y$

$y = 2x - 18$

Yes, inverse is a function

$f^{-1}(x)$

$f(x)$

$(6, -6)$

$(5, -10)$

3. Sketch the graph of the function. Use the graph of f to decide whether the inverse of f is a function of x.
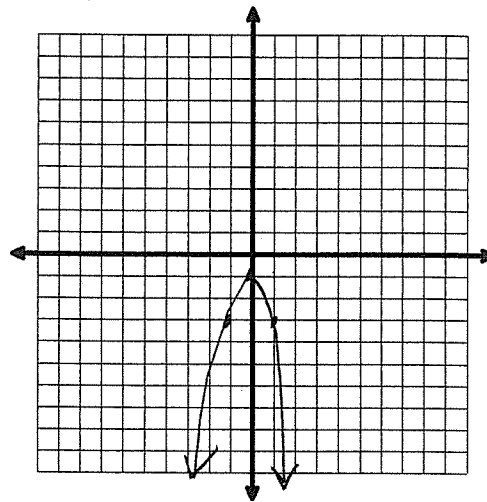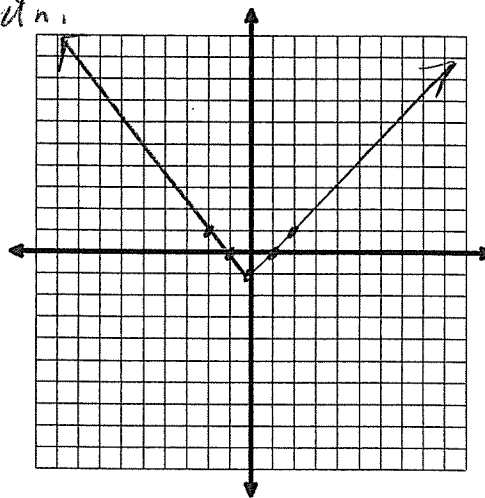
a. $f(x) = x + 1$ *Yes, inverse is a function*

b. $f(x) = -2x^2 - 1$ *No, inverse is NOT a function.*

c. $f(x) = |x| - 1$

No, inverse is NOT a function.

4. Verify using composition of functions to determine if f and g are inverses of each other.

You must find

a. $f(x) = x + 9$ $g(x) = x - 9$ *Yes*

b. $f(x) = 2x - 1$ $g(x) = \dfrac{1}{2}x + \dfrac{1}{2}$ *Yes*

c. $f(x) = \dfrac{-3x + \frac{1}{2}}{}$ $g(x) = -\dfrac{1}{3}x + \dfrac{1}{6}$ *Yes*

5. The formula to convert temperature in degrees Celsius to temperature in degrees Fahrenheit is F(x) = $\frac{9}{5}x + 32$. For this formula, degrees Celsius is the input and degrees Fahrenheit is the output. Find G(x) where the degrees Fahrenheit is the input and degrees Celsius is the output. Are these functions? Are these inverses of each other?

$F(x) = \frac{9}{5}x + 32$

$y = \frac{9}{5}x + 32$

$x = \frac{9}{5}y + 32$

$x - 32 = \frac{9}{5}y$

$\frac{5}{9}(x-32) = y$

$C(x) = \frac{5}{9}(x-32) \Rightarrow$ $\boxed{G(x) = \frac{5}{9}(x-32)}$ $\overset{F° \to C°}{}$

$C(F(x)) = \frac{5}{9}(\frac{9}{5}x + 32 - 32)$

$= \frac{5}{9}(\frac{9}{5}x)$
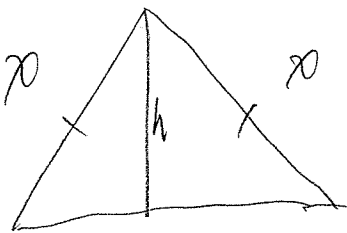
$C(F(x)) = x$

$F(C(x)) = \frac{9}{5}(\frac{5}{9}(x-32)) + 32$

$= x - 32 + 32$

$F(C(x)) = x$

Yes, they are inverses of each other.

Yes, C & F are functions.

6. The height h of an equilateral triangle with sides of length x is h(x) = $\frac{\sqrt{3}x}{2}$. Find the function g(x) so that the height is the input and the length of the side is the output. Are these functions? Are they inverses of each other?

x ⟋⟍ x (triangle with height h)

$h(x) = \frac{\sqrt{3}\,x}{2}$

$y = \frac{\sqrt{3}\,x}{2}$

$x = \frac{\sqrt{3}\,y}{2}$

$\frac{\sqrt{3}}{\sqrt{3}} , \frac{2x}{\sqrt{3}} = y$ /ht.

length of side $\to y = \frac{2x\sqrt{3}}{3}$

$\boxed{g(x) = \frac{2x\sqrt{3}}{3}}$

Yes, h & g are functions.

Yes, they are inverses.

7. You belong to a bowling league in which each bowler's handicap, H, is determined by his or her average, x according to the following function:

$\overset{\text{handicap}}{\swarrow}$ $\overset{\text{avg}}{\swarrow}$

$H(x) = 0.8(200 - x)$

(If the bowler's average is over 200, the handicap is 0.) Find the function A(x) so that the handicap is the input and the average is the output. If your handicap is 32, what is your average?

$y = 0.8(200 - x)$

$x = 0.8(200 - y)$

$\boxed{A(x) = 200 - \dfrac{x}{0.8}}$

$\dfrac{x}{0.8} = 200 - y$

$A(32) = 200 - \dfrac{32}{0.8}$

$y = 200 - \dfrac{x}{0.8}$

$\boxed{A(32) = -200}$

FUNCTIONS ARE YOUR FRIENDS!!!!!!!!!!!!!

8. With a coupon, if you purchase one spaghetti dinner at the regular price, x, you can purchase the second dinner at half price.

a. Write a function, P(x), for the price of the two spaghetti dinners.
b. Write a function, C(x), that represents the total amount spent for the two dinners.
In the total price, include a 15% tip (based on the full regular price of two dinners), and a 7% sales tax.
c. Evaluate C(x) from part b when x is $5.

$P(x) = 1\tfrac{1}{2}x \quad \text{or} \quad 1.5x$

$C(x) = 1.5x + 0.15(2x) + 0.07(2x)$

$C(5) = 1.5(5) + 0.15(2(5)) + 0.07(2(5))$ ~~7(5)~~ 7.50

$= 7.5 + 1.5 \quad + ~~0.70~~ \; 0.53$

$= ~~\$9.75~~$

9.53