GSE Algebra II
Inverse Functions and Function Composition REVIEW

Name_____
Date_____ Period____

Part I – Functions and Relations

1. A function is a special type of relationship where each ___x___ has only one ___y___.
All functions will pass the ___vertical___ line test.

2. A function is called "one-to-one" **if and only if** each element in the domain maps to a unique element in the ___range___. All one-to-one functions will pass the ___vertical___ line test.

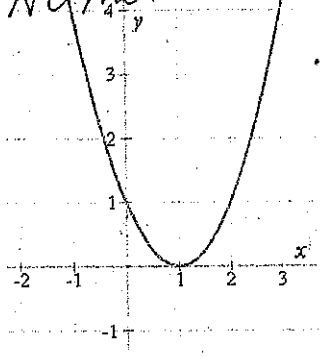
(NOTE: For a function to be called one-to-one, the inverse must be a function.)

For questions 3-6, determine if the relation is a function and if it is one-to-one. Write "YES" or "NO".

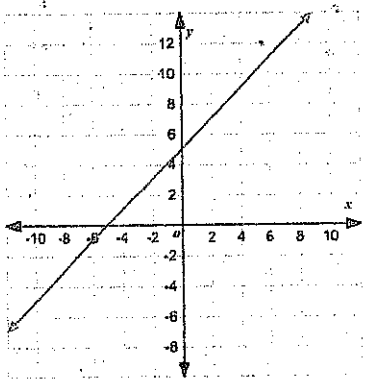
3) (1,2), (2,3), (5,6) yes
(2,1) (3,2) (5,6) one-to-one

4) (1,1), (2,1), (3,1)
(1,1) (1,2) (1,3) – no, not one to one

5) NO, not one-to-one



6) yes, one to one



Part II - Inverses

For questions 7-14, find the inverse of the given function. For the graphs, graph the inverse.

7) $y = 2x - 7$

$x = 2y - 7$
$+7 \quad +7$
$\frac{(x+7)}{2} = \frac{2y}{2}$

$y = \frac{(x+7)}{2}$

$f^{-1}(x) = \frac{x+7}{2}$

8) $f(x) = \frac{x-4}{3}$

$3 \cdot x = \frac{y-4}{3} \cdot 3$
$3x = y - 4$
$+4 \quad +4$

$y = 3x + 4$

$f^{-1}(x) = 3x + 4$

9) $y = x^2 + 1$

$x = y^2 + 1$
$-1 \quad -1$
$\sqrt{(x-1)} = \sqrt{y^2}$

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

10) $g(x) = \sqrt[3]{2x-5} + 9$

$x = \sqrt[3]{2y-5} + 9$
$-9 \quad -9$
$(x-9)^3 = (\sqrt[3]{2y-5})^3$
$(x-9)^3 = 2y - 5$
$+5 \quad +5$

$\frac{2y}{2} = \frac{(x-9)^3 + 5}{2}$

$f^{-1}(x) = \frac{(x-9)^3 + 5}{2}$

11) $y = \frac{7}{2+x}$

$(2+y)x = \frac{7}{(2+y)} \cdot (2+y)$

$(2+y)x = 7$

$\frac{(2+y)x}{x} = \frac{7}{x}$

$(2+y) = \frac{7}{x}$

$-2 \quad -2$

$f^{-1}(x) = \frac{7}{x} - 2$

12) $f(x) = 3x^3$

$\frac{x}{3} = \frac{3y^3}{3}$

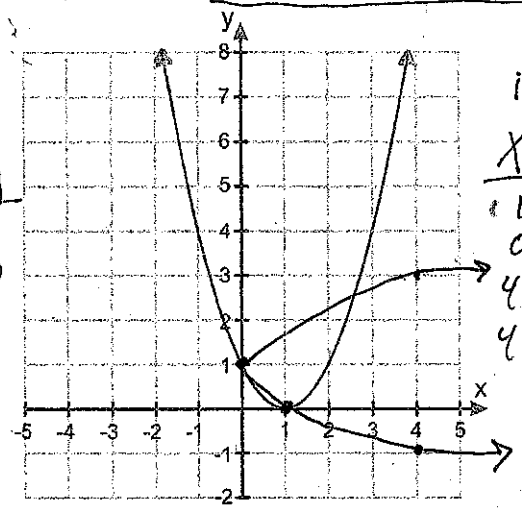
$\sqrt[3]{\frac{x}{3}} = \sqrt[3]{y^3}$

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

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

$y = \frac{\sqrt[3]{x \cdot 9}}{3} = \frac{\sqrt[3]{9x}}{3}$

13)

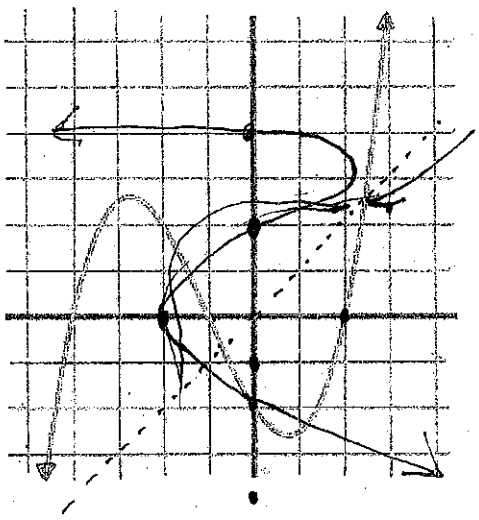


X	y
0	1
1	0
-1	4
3	4

inverse

X	y
1	0
0	1
4	-1
4	3

14)



X	y
-1	0
2	0
-4	0
0	-2
2.5	3
-2	0

inverse

X	y
0	-1
0	2
0	-4
-2	0
3	2.5
0	-2

For Questions 15-18, determine if the functions are inverses using composition.

15) $f(n) = \frac{-16+n}{4}$, $g(n) = 4n + 16$

$f(g(x)) = \frac{-16 + (4n+16)}{4} = \frac{4n}{4} = n$ ☺

$g(f(x)) = \frac{4(-16+n)}{4} + 16 = n$ ☺

yes, inverses

16) $f(x) = 2x + 6$, $g(x) = \frac{1}{2}x - 3$

$f(g(x)) = 2(\frac{1}{2}x - 3) + 6 = x - 6 + 6 = x$ ☺

$g(f(x)) = \frac{1}{2}(2x+6) - 3 = x + 3 - 3 = x$ ☺

yes, inverse

17) $f(x) = 9 - \frac{1}{3}x$, $g(x) = 3x + 3$

$f(g(x)) = 9 - \frac{1}{3}(3x+3) = 9 - x - 1$

$\neq$ not inverse

18) $h(x) = \sqrt[3]{2x+5} - 1$, $r(x) = (2x-1)^3 - 5$

$h(r(x)) = \sqrt[3]{2(2x-1)^3 - 5 + 5} - 1 = \sqrt[3]{2(2x-1)^3} - 1$

not an inverse

For questions 19-22, complete the compositions given:

$f(x) = 7x - 3$ $\quad g(x) = x^2 + 5x - 1$ $\quad h(x) = \frac{1}{3}x + 10$

19) $f(h(9)) =$

$h(9) = \frac{1}{3}(9) + 10 = 13$

$f(13) = 7(13) - 3 = 91 - 3$

$f(h(9)) = 88$

20) $(g \circ f)(2)$

$f(2) = 7(2) - 3 = 11$

$g(11) = (11)^2 + 5(11) - 1 = 121 + 55 - 1 = 176 - 1$

$g(f(2)) = 175$

21) $f(g(x)) = 7(x^2 + 5x - 1) - 3 = 7x^2 + 35x - 7 - 3 = 7x^2 + 35x - 10$

22) $(h \circ g)(x) = \frac{1}{3}(x^2 + 5x - 1) + 10$

ALSO, study the "Applications of Compositions" packet for the QUEST.