Name: ____________

Calculus

Date: ____________ Hr.: ____

Quiz Review 4.1

$f(g(x)) = x \quad g(f(x)) = x$

Determine whether f and g are inverses (function composition both ways)

1) $g(x)=4-\frac{3}{2}x$

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

$f(4-\frac{3}{2}x)=x$

$\frac{1}{2}(4-\frac{3}{2}x)+\frac{3}{2}=x$

$2-\frac{3}{4}x+\frac{3}{2}\neq x$

not inverses

2) $f(n)=\frac{-16+n}{4}$

$g(n)=4n+16$

$g\left(\frac{-16+n}{4}\right)=n$

$4\left(\frac{-16+n}{\cancel{4}}\right)+16=n$

$-16+n+16=n$

$n=n$

$f(4n+16)=n$

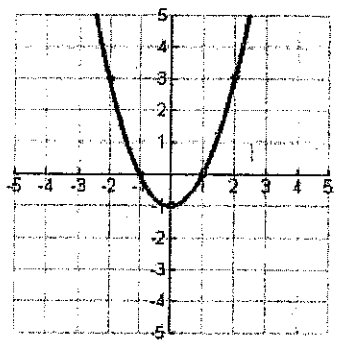
$\frac{-16+4n+16}{4}=n$

$\frac{4n}{4}=n$

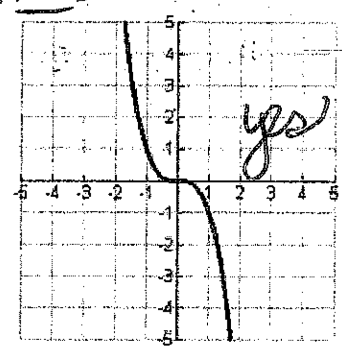
$n=n$

are inverses

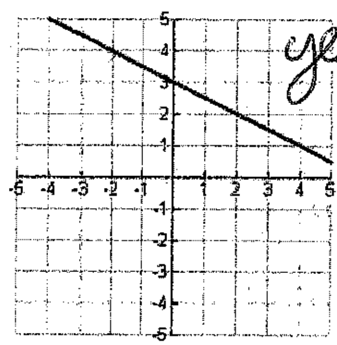
In #3, use the HLT to determine if the following functions are one-to-one.



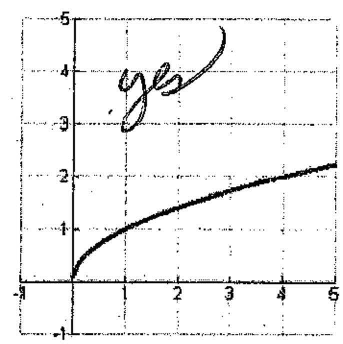
NO



yes



yes



yes

8

(9) $h(x) = \sqrt[3]{x} - 3$

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

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

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

$\boxed{(f^{-1})'(x) = 3(x+3)^2}$

(10) $g(x) = \frac{1}{x} - 2$

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

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

$y(x+2) = 1$

$\boxed{g^{-1}(x) = y = \frac{1}{x+2}}$

$g'(x) = x^{-1} - 2$

$= -1x^{-2}$

$g'(x) = \frac{-1}{x2}$

$(g^{-1})'(x) = \frac{1}{g'\left(\frac{1}{x+2}\right)}$

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

$= -1 \cdot (x+2)^2$

$\boxed{(g^{-1})'(x) = -(x+2)^2}$

(11) $h(x) = 2x^3 + 3$

$x = 2y^3 + 3$

$1 \cdot \frac{dx}{dy} = 6y^2$

$\boxed{(h^{-1})'(x) = \frac{1}{6y^2}}$

(12). $g(x) = -4x + 1$

$x = -4y + 1$

$x - 1 = -4y$

$-\frac{1}{4}x + \frac{1}{4} = y = f^{-1}(x)$

$-\frac{1}{4} = (f^{-1})'(x)$

(13) $g(x) = \frac{7x+18}{2}$

$g(x) = \frac{7}{2}x + 9$

$x = \frac{7}{2}y + 9$

$x - 9 = \frac{7}{2}y$

$\frac{2x-18}{7} = y = f^{-1}(x)$

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

(14) $f(x) = x^3 + x - 1$

implicit

$x = y^3 + y - 1$

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

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

$\boxed{\frac{1}{3y^2+1} = \frac{dy}{dx}}$

#5

$x = y^3 + y - 1$

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

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

(15) #9 yes +

#10 yes −

#11 yes +

#12 yes −

#13 yes +

#14 yes +

~~#15~~