ROSLYN HIGH SCHOOL CALCULUS AB S. Conrad, S. Weiss

INVERSE FUNCTION THEOREM

Theorem: Version I: If f and g are inverses, then $g'(y) = \frac{1}{f'(x)}$.

Version II: $\frac{dx}{dy} = \frac{1}{\frac{dy}{dx}}$. What is the "hazard" in writing the theorem this way?

1. Let $f(x) = x^3 + x$. If h is the inverse of f, then $h'(2) =$

   A) 1/13 B) 1/4 C) 1 D) 4 E) 13

2. Suppose $f(x) = x^2 + 1$ for $x > 0$, and $f[g(x)] = x$.

   a) Find $g'(10)$.

   b) Find $g'(3)$.

3. Suppose $f(x) = x^3 - 2x + 1$ and $g(x) = f^{-1}(x)$.

   a) Find $g'(0)$.

   b) Find $g'(5)$.

4. If $f(x) = \sin x + \cos x$, $0 \le x \le \pi$, and $g = f^{-1}$, find $g'(-1)$.

5. If $f(x) = (x-1)(x-2)(x-3) = x^3-6x^2+11x+6$ and $g = f^{-1}$, find $g'(6)$

6. If $f(x) = 5x^2 + 1$ for $x \ge 0$, and $g = f^{-1}$, find $g'(11)$

7. If $F(x) = 3x^2 - x$ for $x > 1$, and $F[t(x)] = x$, find $t'(10)$.

8. If $f(x) = (x-2)\sqrt{x+1}$. Let g be the inverse of f. Find $g'(18)$.

9. Find an equation of the line tangent to the inverse of $f(x) = \frac{x}{x - 2}$ at the point (2,4).

USE OF CHARTS

x	f(x)	g(x)	f'(x)	g'(x)
2	2	-1	5	-4
3	4	2	1	0
4	-2	6	-3	2

10. Find the derivative of f^{-1} at $x = 4$.

11. Find the derivative of g^{-1} at $x = 6$.

12. Find the derivative of g^{-1} at $x = 2$.