The Derivative of the Inverse Name_____

Classwork Derivatives (2) Day 5

Assume that f(x) is differentiable and one-to-one with inverse $f^{-1}(x)$. If b belongs to the domain of $f^{-1}(x)$ and $f'(f^{-1}(x)) \neq 0$, then $(f^{-1})'(b)$ exists and

$$(f^{-1})'(\mathrm{AT}) = \frac{1}{f'(f^{-1}(\mathrm{AT}))} \bullet \frac{d}{dx}[AT]$$

1. If f(4)=5 and f ' (4) = $\frac{2}{3}$, find $(f^{-1})'(5)$.

x	f(x)	f '(x)
2	3	4
3	$\frac{35}{4}$	$\frac{31}{4}$
4	19	13

2-7: Use the table to the right.

2. Find $f^{-1}(3)$	3. Find $(f^{-1})'(3)$	4. Find f^{-1}(x) when x = 19.
5. Find $(f^{-1})'(19)$.	6. Find $f^{-1}(\frac{35}{4})$.	7. Find $(f^{-1})'(\frac{35}{4})$.

8. Suppose that P = (2, 4) lies on the graph of f(x) and that the slope of the tangent line through P is m = 3. Assuming that f^{-1}(x) exists, what is the slope of the tangent line to the graph of f^{-1}(x) at the point Q = (4, 2)?

9. If f(x) = 2x + 7, find $(f^{-1})'(3)$.

10. If f(x) = $x^2 - 1$ has restricted domain [0, ∞), find $(f^{-1})'(15)$.

Answers: 1) $\frac{3}{2}$ 2) 2 3) $\frac{1}{4}$ 4) 4 5) $\frac{1}{13}$ 6) 3 7) $\frac{4}{31}$ 8) $\frac{1}{3}$ 9) ½ 10) $\frac{1}{8}$

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For problems 1-2, find $\frac{d}{dx}\left(f^{-1}(x)\right)$ at x=a

11. $f(x)=4x^3-2x$ where a=-2

12. $f(x)=\frac{1}{1+x}$ where a=$\frac{1}{4}$

Derivatives of Inverse Trig. Functions

For problems 3-6, find $f'(x)$.

13. $f(x)=\sin^{-1}(x^2)$

14. $f(x)=\tan^{-1}(1-x)$

15. $f(x)=\sin^{-1}(e^x)$

16. $f(x)=\tan^{-1}\left(\frac{1}{x}\right)$

Answers: 11) $\frac{1}{10}$ 12) -16 13) $\frac{2x}{\sqrt{1-x^4}}$ 14) $\frac{-1}{2-2x+x^2}$ 15) $\frac{e^x}{\sqrt{1-e^{2x}}}$ 16) $\frac{-1}{x^2+1}$