## 3.8 Day 1 Derivatives of Inverse Functions

If f is differentiable at every point on an interval I, and $f'(x) \neq 0$ on I, then $g(x) = f^{-1}$ is differentiable at every point of the interior of the interval f(I) and $g'(f(x)) = \frac{1}{f'(x)}$

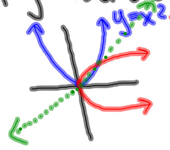
Add this to your Derivative Formulas Packet - you will need to put a #16A in the right margin.

Recall from 1.5 Inverse Packet

① To find an inverse simply switch the x & y values

Ex: If $f(2)=7$ then $f^{-1}(7)=2$

② The graph of y & $y^{-1}$ are always symmetric to the line $y=x$




$x=y^2$

$\pm\sqrt{x}=y$

③ The composition of a function & its inverse always gives x

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

$g(f(x))=x$

$$\frac{g'(f(x))\cdot \cancel{f'(x)}}{\cancel{f'(x)}} = \frac{1}{f'(x)}$$

$$\boxed{g'(f(x)) = \frac{1}{f'(x)}}$$

Oct 14-10:57 AM

Given the function $f(x) = x^5 - x^3 + 2x$, g(x) is the inverse of f(x), and $g(2) = 1$: find $g'(2)$.

then $f(1)=2$

$f(x)=2$

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

$$g'(2) = \frac{1}{f'(1)}$$

$f'(x) = 5x^4 - 3x^2 + 2$

$f'(1) = 4$

$$\boxed{g'(2) = \frac{1}{4}}$$

Oct 21-8:13 AM

Given the function $f(x) = 3x^5 + 2x^3$ and g(x) is the inverse of f(x): find g'(5).

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

$$g'(5) = \frac{1}{f'(1)}$$

$$\boxed{g'(5) = \frac{1}{21}}$$

$f(x) = 5$

$5 = 3x^5 + 2x^3$

$0 = 3x^5 + 2x^3 - 5$

by using my calc $x = 1$

$f(1) = 5$

$f'(x) = 15x^4 + 6x^2$

$f'(1) = 21$

Oct 21-8:16 AM