Notes: Derivatives Of Inverse Functions Derivatives (2) Day 4

Remember:
How do you find the inverse of a function?
Easy as 1 → 2 → 3

1.
2.
3.

Example 1: Find the inverse of $f(x) = \frac{3x}{x+4}$

Thm.
<u>Derivative of Inverse Functions:</u>
Let $f(x)$ be some function
Let $f^{-1}(x)$ be the inverse
Then $\frac{d}{dx}\left[f^{-1}(x)\right] = \frac{1}{f'[f^{-1}(x)]}$

D Derivative of the an Inverse	

Example 2: Find the Derivative of the Inverse given $f(x) = x^2 + 4$

A. Find the inverse and then take derivative

B. Use the Thm. to find the derivative of the inverse.

Example 3: Calculate the derivative of the inverse **without** finding the inverse function.

Find $\frac{d}{dx}\left[f^{-1}(x)\right]_{x=1}$ if $f(x) = x + e^{x}$

Example 4:

A. Find $\left(f^{-1}\right)'(3)$ if $f(x) = 2x^3 - 3x + 3$

B. Find $\left(f^{-1}\right)'(2)$ if $f(x) = 2x^3 - 3x + 3$

Example 5: Find $\frac{d}{dx}\left[f^{-1}(x)\right]_{x=-1}$ if $f(x) = x^3 - 9$

$\frac{d}{dx}\left[\sin^{-1}(AT)\right]$ ________________ $\frac{d}{dx}\left[\cos^{-1}(AT)\right]$ ________________

$\frac{d}{dx}\left[\tan^{-1}(AT)\right]$ ________________ $\frac{d}{dx}\left[\cot^{-1}(AT)\right]$ ________________

$\frac{d}{dx}\left[\csc^{-1}(AT)\right]$ ________________ $\frac{d}{dx}\left[\sec^{-1}(AT)\right]$ ________________

D $\frac{d}{dx}\left[\sin^{-1}(AT)\right]$	D $\frac{d}{dx}\left[\cos^{-1}(AT)\right]$	D $\frac{d}{dx}\left[\tan^{-1}(AT)\right]$
D $\frac{d}{dx}\left[\cot^{-1}(AT)\right]$	D $\frac{d}{dx}\left[\csc^{-1}(AT)\right]$	D $\frac{d}{dx}\left[\sec^{-1}(AT)\right]$

Example 6: Calculate $\frac{d}{dx}\left[\tan^{-1}(3x+1)\right]$

Example 7: Calculate $\frac{d}{dx}\left[\csc^{-1}(e^{x}+1)\right]_{x=0}$

Example 8: $\frac{d}{dx}\left[\sin^{-1}(12x)\right]$

Example 9: $f(x)=\arcsin(2x)$ *Find* $f'(2)$

Example 10:

$f(x) = \left(\cos^{-1}(x^2)\right)^3$ Find $f'(x)$

Example 11:

$f(x) = 2x\cos^{-1}\left(5x^2\right)$ Find $f'(x)$

Example 12:

$f(x) = \sqrt{1-x^2}\arcsin x$ Find $f'(x)$

Example 13: $\dfrac{d}{dx}\left[\tan^{-1}\left(\dfrac{1+x}{1-x}\right)\right]$