

Remember:

How do you find the inverse of a function?

Easy as $1 \rightarrow 2 \rightarrow 3$

- 1.
- 2.
- 3.

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

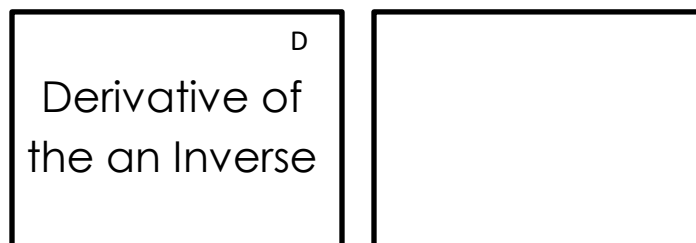
Thm.

Derivative of Inverse Functions:

Let $f(x)$ be some function

Let $f^{-1}(x)$ be the inverse

$$\text{Then } \frac{d}{dx}[f^{-1}(x)] = \frac{1}{f'[f^{-1}(x)]}$$



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

Example 4:

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

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

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

$$\frac{d}{dx}[\sin^{-1}(AT)] \text{ _____}$$

$$\frac{d}{dx}[\cos^{-1}(AT)] \text{ _____}$$

$$\frac{d}{dx}[\tan^{-1}(AT)] \text{ _____}$$

$$\frac{d}{dx}[\cot^{-1}(AT)] \text{ _____}$$

$$\frac{d}{dx}[\csc^{-1}(AT)] \text{ _____}$$

$$\frac{d}{dx}[\sec^{-1}(AT)] \text{ _____}$$

D
$\frac{d}{dx}[\sin^{-1}(AT)]$
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$\frac{d}{dx}[\tan^{-1}(AT)]$
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$\frac{d}{dx}[\sec^{-1}(AT)]$

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

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

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

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

Example 10:

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

Example 11:

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

Example 12:

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

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