

WARM UP

1. The table below gives values of the differentiable functions f and g , and f' , the derivative of f . If $g(x) = f^{-1}(x)$, what is the value of $g'(4)$?

x	$f(x)$	$g(x)$	$f'(x)$
-4	0	-9	5
-2	4	-7	4
0	6	-4	2
2	7	-3	1
4	10	-2	3

2. Find d^2y/dx^2 of $\sin x + 1 = \cos y$

3. Find dy/dx of $y = \cos^{-1}(3 - 2x^2)$

Derivatives of Exponential Functions

Objective:

- Find the derivative of exponential functions.

And now for the hardest derivative we learn in this class.....

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$$\frac{d}{dx} [e^x] = e^x$$

or more formally,

$$\frac{d}{dx} [e^{f(x)}] = e^{f(x)} \cdot f'(x)$$

Example 1:

$$\text{Find } \frac{dy}{dx} \text{ if } y = e^{(x+x^2)}$$

Example 2: Calculate $f'(0)$ of the graph $f(x) = e^x \cos x$

General exponential derivative:

$$\frac{d}{dx} [a^{f(x)}] = a^{f(x)} \cdot \ln a \cdot f'(x)$$

Why doesn't d/dx of e^x not have the "ln" part?

Example 3:

$$\frac{d}{dx} [7^{-3/x}]$$

Example 4:

$$\frac{d}{dx} [x^2 \cdot 5^{\sin^2(4x)}]$$

Example 5: Find the coordinates of any points where $f(x) = xe^x$ has a horizontal tangent line.

Example 6: Find the equation of the tangent line to $y = x^2e^x - 2xe^x + 2e^x$ at the point $(1, e)$

Example 7:

Find $\frac{dy}{dx}$ for $e^{xy} + x^2 - y^2 = 10$