§5.4: Natural Log Derivatives

"I WILL …

…solve natural log derivatives."

I. Review

A. Forms

1. Exponential Form: $y = e^x$
2. Logarithmic Form: $\ln y = x$
3. e and ln are inverses
4. $y = \log_b x$ means $x = b^y$ where b and $x > 0$
5. $y = \ln x$ means $x = e^y$ where $x > 0$

B. Properties of Exponents

1. Multiplying Exponents: $e^a\ e^b = e^{a+b}$ (Base, Base, Add)
2. Dividing Exponents: $\frac{e^a}{e^b} = e^{a-b}$ (When we divide, we subtract)
3. Domain: $(-\infty, \infty)$
4. Range: $(0, \infty)$

Ex 1: Convert $\ln\frac{2}{5} = -0.916$ to exponential form	Ex 2: Solve $-6 + 3e^{2x} = 9$
Your Turn: Convert $e^{2x} = 3$ to logarithmic form	

II. Natural Log Derivative Rules

A. $\frac{d}{dx}[e^u] =$ _____

Ex 3: Find the derivative of $y = e^{-2x}$	Ex 4: Find the derivative of $y = 3e^{2x+2}$
Your Turn: Solve for the derivative of $y = e^{3x^2}$	Ex 5: Solve for the derivative of $y = x^2e^{-x}$

Ex 6: Solve for the derivative of $y = \ln(4 + e^{3x})$	Ex 7: Solve the derivative of $f(x) = \pi x^5 + e^{5x}$
Your Turn: Find the derivative of $y = \ln\left(e^{x^3}\right)$	Ex 8: Find the derivative of $y = \ln\left(\frac{1-e^x}{1+e^x}\right)$
Ex 9: Use implicit differentiation to find the derivative of $e^{xy} + x^2 - y^2 = 10$	Your Turn: Solve for the derivative of $e^{x^2y} - x^2 + y^2 = 5$

Ex 10: Let f be a twice-differentiable function defined on the interval $-1.2 < x < 3.2$ with $f(1) = 2$. The graph of f', the derivative of f, is shown above. The graph of f' crosses the x-axis at $x = -1$ and $x = 3$ and has a horizontal tangent at $x = 2$. Let g be the function given by $g(x) = e^{f(x)}$. Write an equation for the line tangent to the graph of g at $x = 1$.

AP 1) Given $y = xe^x$, Solve for y'=

(A) $y' = xe^x + e^x$ (B) $y' = x^2e^x + 2xe^x$ (C) $y' = xe^x$ (D) $y' = e^x$

Vocabulary	Process and Connections	Answer and Justifications

Assignment: Page 352: 25-28 all, 33-49 odd, 55-59 odd, 63, 65