

Logarithmic Differentiation

We know that $\frac{d}{dx}e^x =$ _____ and $\frac{d}{dx}(\ln x) =$ _____

The derivative for $y = \ln x$ enables us to find the derivatives of all other logarithmic functions. This process is called logarithmic differentiation.

Differentiation of Exponential Functions

Find the derivative of $y = a^x$

Use this result to find the derivative of the following. Notice how you can either remember the result above, or simply take the “*ln of both sides*” to differentiate.

a) $y = 2^x$

b) $y = 7^{x^2+5x}$

Logarithmic Differentiation can also be used to prove the power rule where n is any real number.
(We only proved it for positive integers)

Prove that if n is any real number and $f(x) = x^n$, then $f'(x) = nx^{n-1}$

Derivatives of Logarithmic Functions

$$y = \log_a x$$

Use the result above to find the derivative of the following:

a) $y = \log_5 x$

b) $y = \ln(x^2 + 3x)$

c) $y = \log_6(x^2 + 3x)$

Sketch the following graph

$$y = 2x (\ln x)^2$$